OLD DOMINION UNIVERSITY RESEARCH FOUNDATION

DEPARTMENT OF ELECTRICAL ENGINEERING TECHNOLOGY
SCHOOL OF ENGINEERING
OLD DOMINION UNIVERSITY
NORFOLK, VIRGINIA

DEVELOPMENT OF COMPUTER MODELS FOR THE PREDICTION OF LARGE DISTORTED ANTENNA CHARACTERISTICS

By

Steven M. Moskowitz, Principal Investigator

Final Report
For the period ending July 15, 1982

Prepared for the
National Aeronautics and Space Administration
Langley Research Center
Hampton, Virginia

Under
Research Grant NAG1-63
Marion C. Bailey, Technical Monitor
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DEVELOPMENT OF COMPUTER MODELS FOR THE PREDICTION
OF LARGE DISTORTED ANTENNA CHARACTERISTICS

By

Steven M. Moskowitz*

ABSTRACT

A program for calculating the radiation patterns of analytic reflector antennas, using geometric optics and aperture plane integration techniques, was modified and extended to include nonanalytic surfaces.

The original program, while capable of predicting patterns for a variety of reflectors, both smooth and multi-panelled, was subject to the restriction that the surface had to be expressed analytically, i.e., described by a set of mathematical equations. This restriction was removed by adapting a technique which allows the reflector configuration to be interpolated from a finite set of points measured on the surface.

Criteria for choosing both the number and distribution of these measured surface points were developed by comparing the predicted antenna radiation patterns with measured laboratory results. Test cases involved relatively smooth as well as grossly distorted arbitrary surfaces.

Finally, surface point accuracies were established by applying random error analysis to the measurement process.

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I. INTRODUCTION

The original model, upon which this work was based, was developed to predict the r.f. radiation characteristics of paraboloidal reflectors (ref. 1). It was subsequently refined (ref. 2) and then expanded to include ellipsoidal, spherical (ref. 3) and planar surfaces (ref. 4). More recently, the program was generalized to include reflectors constructed from several panels or sections [5].

The objective of this work was to modify the above program, named REFLECTR, to make it capable of predicting radiation patterns of arbitrary surfaces. Although rewritten in order to reduce core memory storage requirements, the original ray-tracing, aperture plane integration processes remain the same. These processes are discussed, in this report, only to the extent needed to give meaning and understanding to the new spline interpolation and successive approximation methods which are detailed in Sections II and IV. The reader is referred to the references for a comprehensive discussion of the original theory, mathematics and program statements (ref. 5).

The work described herein was essentially a three-phase effort and reported in Section III as follows:

(1) Program modification-evaluation and incorporation of a technique to interpolate arbitrary surface configurations.

(2) Testing and evaluation of program using relatively smooth arbitrary reflector surfaces. Development of criteria for surface point distribution and measurement accuracies.

(3) Testing and evaluation of program using distorted arbitrary reflector surfaces. Development of comprehensive criteria for surface point distribution and measurement accuracies.

The final program, PARSPLN, is written in standard FORTRAN and should run on any FORTRAN compiler with little or no change. A complete descrip-

tion of how to create an input file is discussed in Section IV and examples of test cases and outputs provided in the appendix.

PARSPLN takes about 1500 octal seconds to run and requires about 250K to 330K bytes of core storage depending upon the number of mersured points used to evaluate the surface.

II. THEORETICAL DEVELOPMENT

A. Original Theory

In the original models, the radiation pattern from the feed antenna was divided into a set of rays subtending the reflector surface (Fig. 1). Each ray was represented by a set of parametric equations:

$$\begin{bmatrix} z = f_z(r) = b_{3,1}\ r - b_{3,2} \\ y = f_y(r) = b_{2,1}\ r - b_{2,2} \\ x = f_x(r) = b_{1,1}\ r - b_{1,2} \end{bmatrix}$$

where the x, y and z coordinates of any point along the ray were expressed as a function of the distance, r, to that point from the ray origin.

The equations of each ray were solved simultaneously with the equation of the reflector surface to find a point of intersection. A unit normal was then determined by differentiating the reflector surface at that point and a reflected ray traced to an aperture plane located a short distance in front of the reflector.

The electromagnetic field contributions of each ray were then quantized along constant grid bars on the aperture plane and these results integrated over its surface to obtain the total radiation pattern.

B. Arbitrary Surface Representation

To represent a nonanalytic reflector a surface spline function was utilized [6]. The spline function interpolates the reflector surface by computing the surface extent, x_{sp}, at any requested y, z coordinate using a set of known points (x_i, y_i, z_i) measured on the surface:

$$x_{sp} = f_{sp}(y, z) = k_o + k_1 y + k_2 z + \sum_{i=1}^{N} F_i\, r_i^2 \ln r_i^2 \qquad (1)$$

where

$$r_i^2 = (y - y_i)^2 + (z - z_i)^2.$$

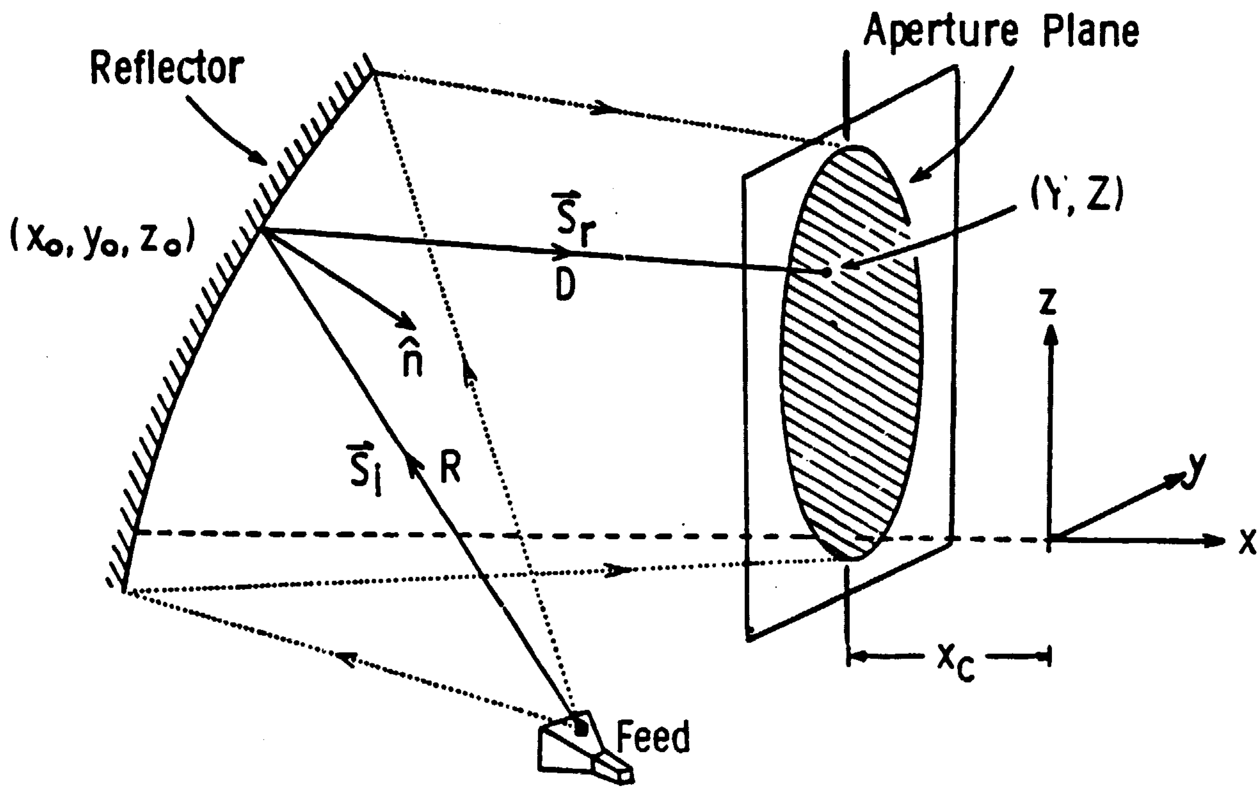


Figure 1. Geometry of the reflector antenna.

The N + 3 unknowns (k_0, k_1, k_2, F_i) must first be determined using the N measured points in:

$$\sum_{i=1}^{N} F_i = \sum_{i=1}^{N} y_i F_i = \sum_{i=1}^{N} z_i F_i = 0$$

and (2)

$$x_j = k_0 + k_1 y_j + k_2 z_j + \sum_{i=1}^{N} F_i r_{ij}^2 \ln r_{ij}^2 \quad \text{for } (j = 1, N)$$

where

$$r_{ij}^2 = (y_i - y_j)^2 + (z_i - z_j)^2.$$

Special provisions are made in the program for the case where $r = 0$ since $\ln r^2$ does not exist even though:

$$\lim_{r \to 0} r \ln r^2 = 0$$

The spline function can be differentiated to give (for example):

$$\frac{\partial f_{sp}(y,z)}{\partial y} = k_1 + 2 \sum_{i=1}^{N} F_i (1 + \ln r_i^2)(y - y_i) \tag{3}$$

thus allowing computation of unit normals on the surface and subsequent completion of the reflected ray-tracing procedure required by the original program.

Solution of the spline function (equation 2) was accomplished by calling upon library subroutine GELIM (Appendix E1). Its purpose is to solve a system of real linear equations represented by the matrix equation B = AX where X is the rectangular solution matrix (unknown coefficients) of dimension (N + 3, 1).

Solution of a system using three known points, for example, would be accomplished by arranging the matrix elements thus:

$$
\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 & y_1 & z_1 & r_{11}^2 \ln r_{11}^2 & r_{21}^2 \ln r_{21}^2 & r_{31}^2 \ln r_{31}^2 \\ 1 & y_2 & z_2 & r_{12}^2 \ln r_{12}^2 & r_{22}^2 \ln r_{22}^2 & r_{32}^2 \ln r_{32}^2 \\ 1 & y_3 & z_3 & r_{13}^2 \ln r_{13}^2 & r_{23}^2 \ln r_{23}^2 & r_{33}^2 \ln r_{33}^2 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & y_1 & y_2 & y_3 \\ 0 & 0 & 0 & z_1 & z_2 & z_3 \end{bmatrix} \begin{bmatrix} k_0 \\ k_1 \\ k_2 \\ F_1 \\ F_2 \\ F_3 \end{bmatrix} \tag{4}
$$

C. Successive Approximation Technique

Once the spline coefficients are established the ray-tracing procedure is begun by carrying out a successive approximation routine for each of the vector rays from the feed antenna. As depicted in the flow chart of Figure 2 the point of intersection of each ray with the reflector surface is found by varying the length of the ray and comparing its x coordinate with the x_{sp} value (surface extent) of the reflector predicted at the same y, z coordinates. The vector length is varied and the process repeated until a suitable match is obtained.

Once the point of intersection is found, the spline function differentials are evaluated and the unit normal vector at the point is computed.

Control is now returned to the original program to complete the computation of the ray reflected to the aperture plane and subsequent determination of the reflector radiation pattern.

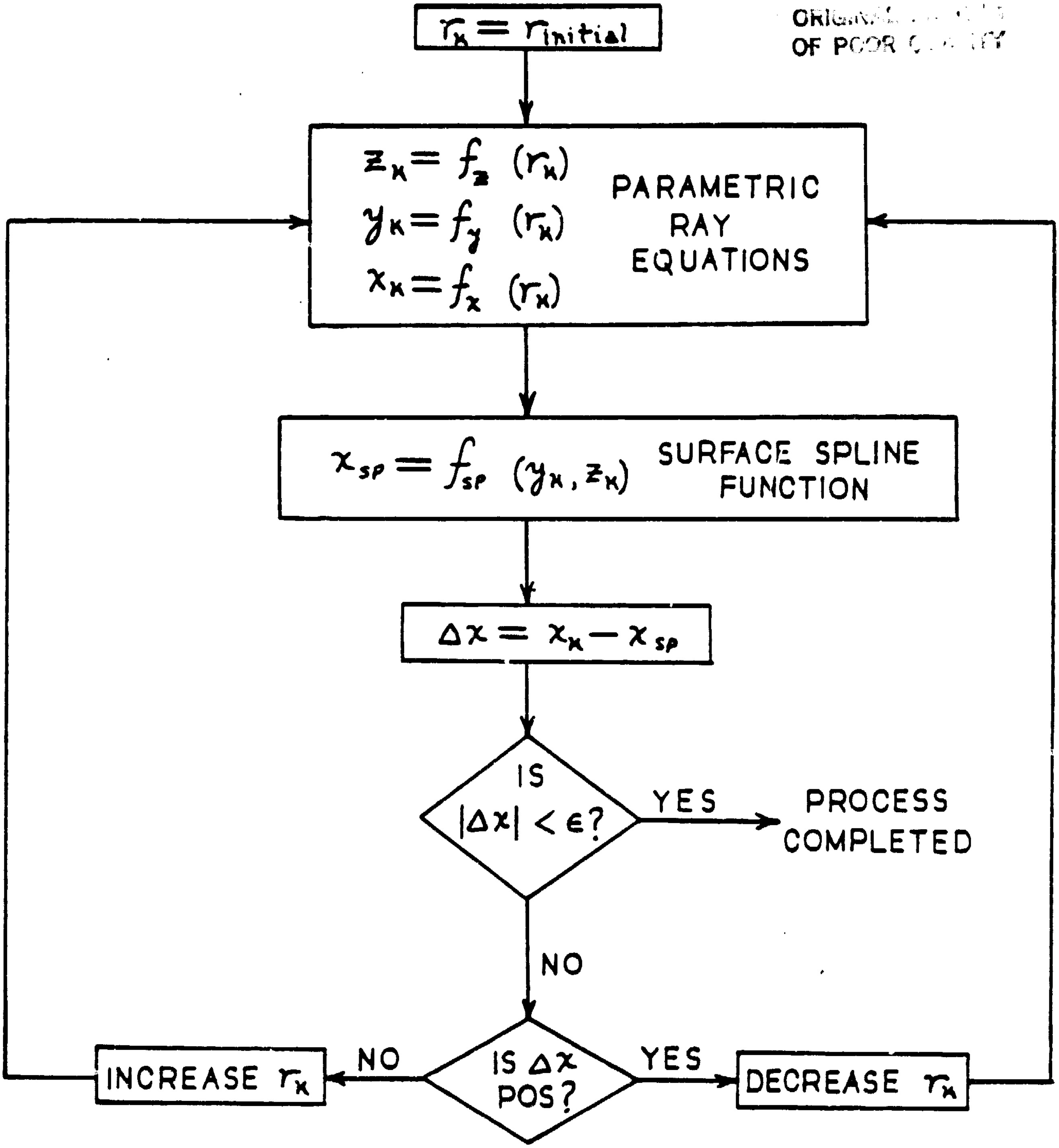


Figure 2. Successive approximation routine.

III. TESTING AND RESULTS

A. Spline Surface Evaluation

Program SPLINE (Section IV) was written to interpolate an arbitrary surface using a fixed number of known or measured points. The accuracy with which this is accomplished was found to be a function of both the number of known points used and of their distribution. Test cases for spherical, ellipsoidal and paraboloidal mathematical sections were run using many different concentrations and distributions of known points. The results, in all cases, led to the same conclusions as illustrated by the test case described below.

Figure 3 shows a paraboloidal reflector surface very similar to the actual model used in the radiation pattern tests (Sections III.B and C). Figures 4 and 5 show five different known point distributions inside a slightly elliptical boundary which is the aperture plane projection of the reflector's edge. Distributions A200, B200 and C200 (Fig. 4) each contain 200 points. In A200 the points have a fairly uniform spread. The points in B200 have a slightly greater concentration around the perimeter and those of C200 a much heavier concentration around the reflector edge.

Figure 5 shows distributions C100 and C300 along with C200 described above. C200 was obtained by adding 100 points to C100 and C300 was similarly obtained by adding 100 points to C200. The points were added in such a manner as to keep the relative concentrations of points (percentage of points in each area) the same in each distribution.

SPLINE was evaluated by comparing the actual (mathematical) surface values at 1?0 evenly distributed interior positions with the interpolated surface values using each of the five distributions discussed above. The output (Appendix B) lists the y and z coordinates, the actual surface extent (TRUE X), the predicted surface coordinate (SPLINE X), the difference between the two (TRU-SPL) and the percentage error in percent (PER ERR). These results are summarized in Table 1 below showing both the average percentage error and the standard deviation for each distribution.

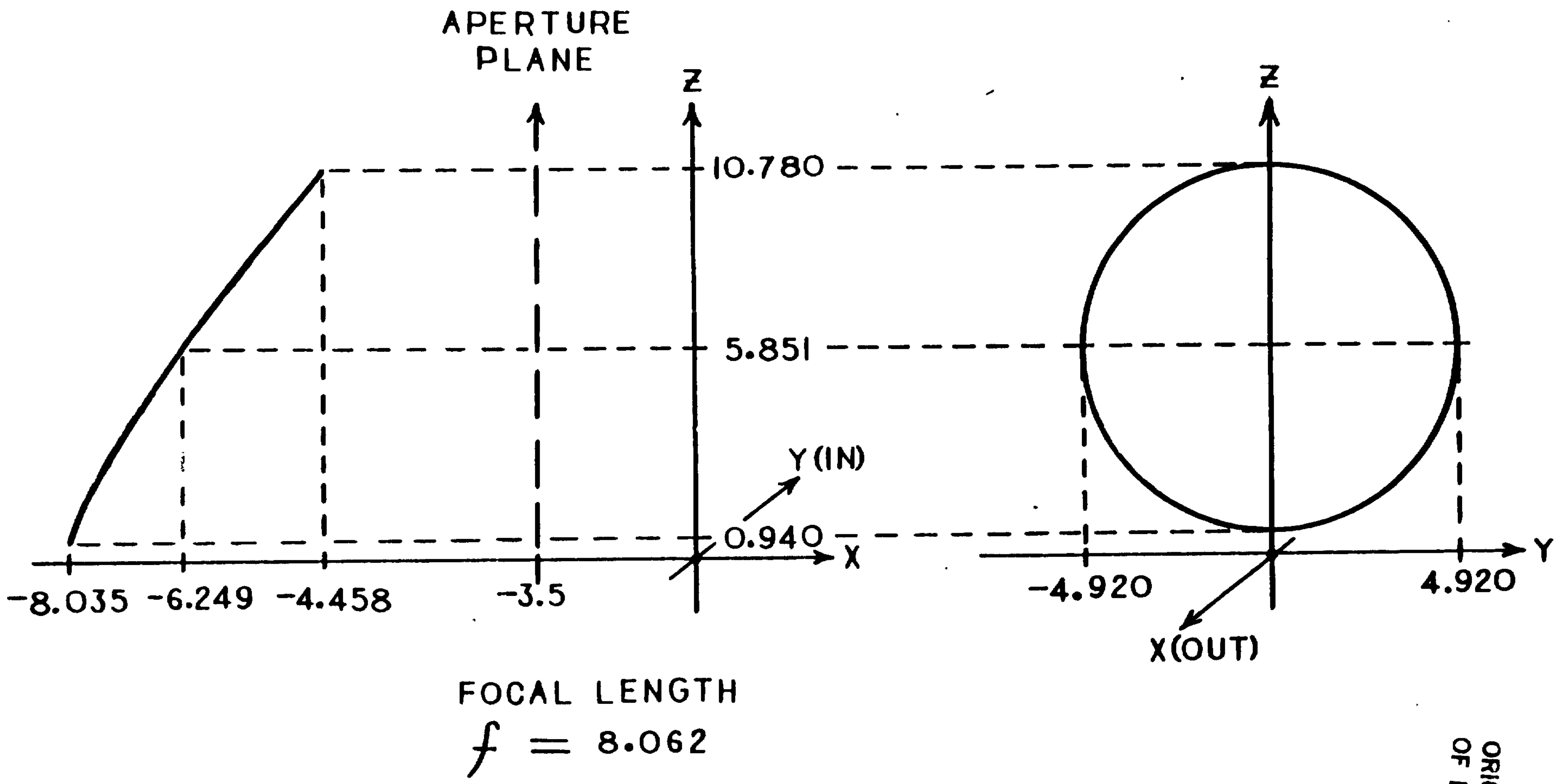


Figure 3. Paraboloidal surface test case.

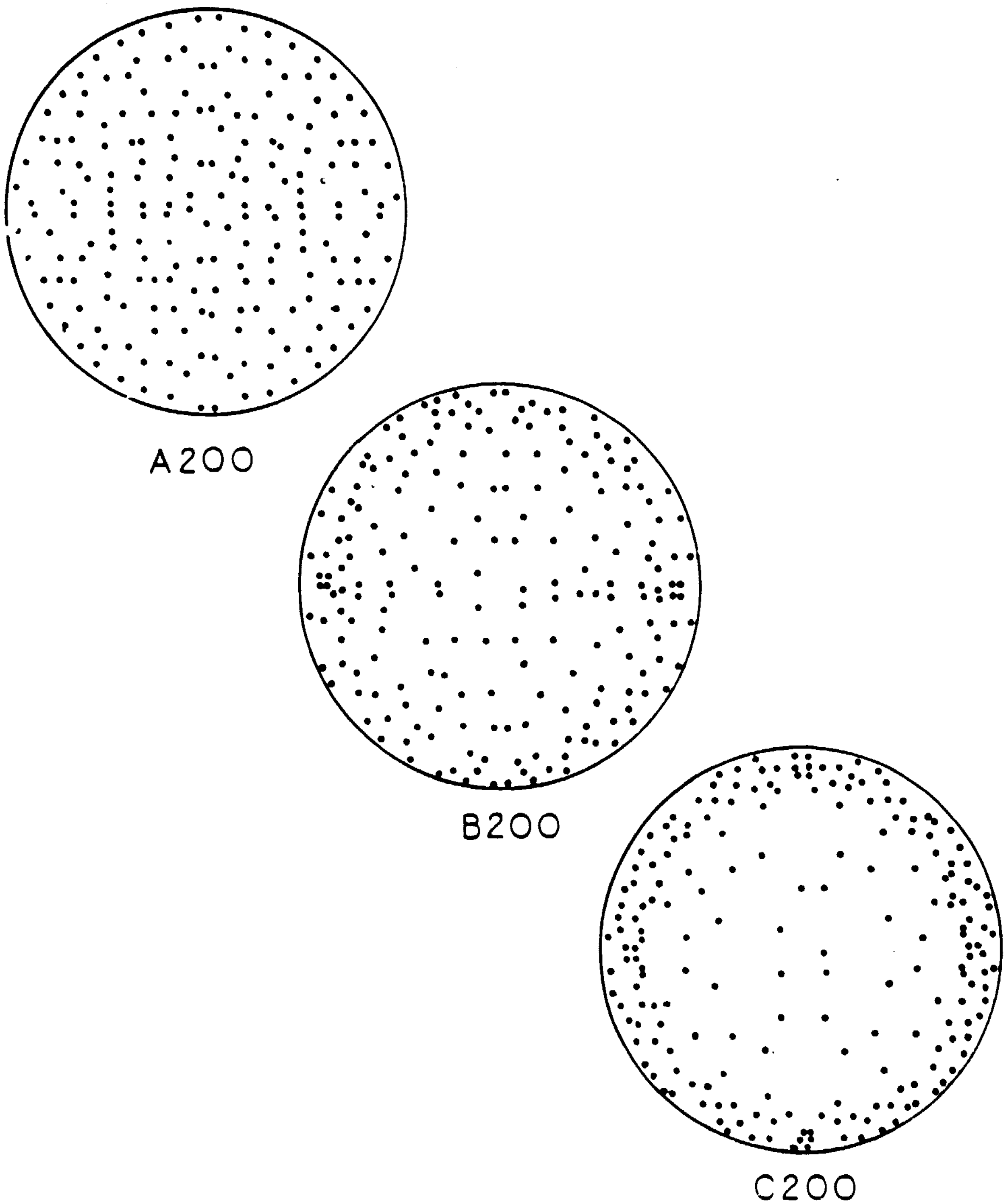


Figure 4. Known point distributions.

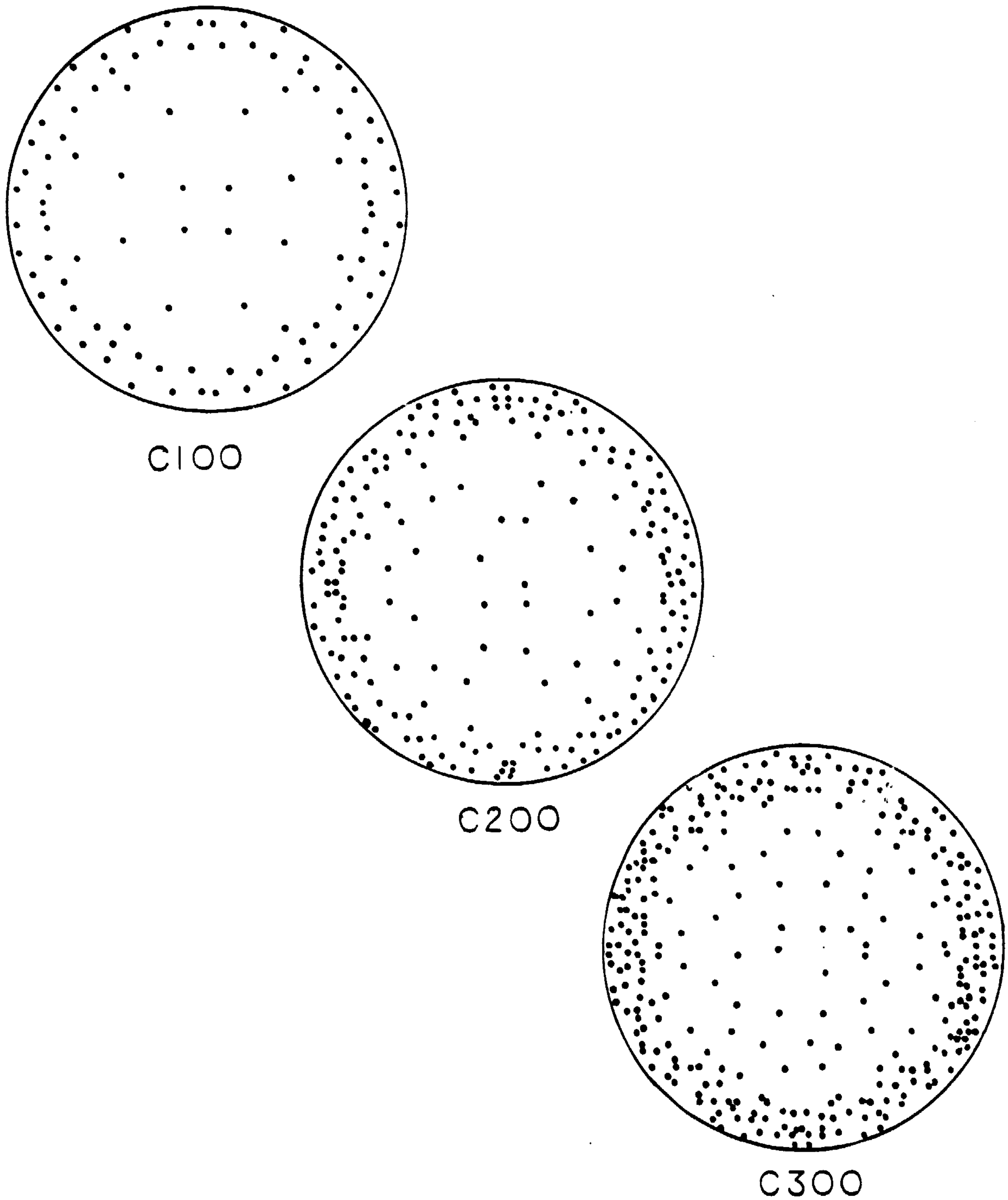


Figure 5. Known point distributions.

Table 1. Evaluation of distribution.

	Percentage Errors (%)	
Distribution	Average	σ
A200	-0.0043	0.0414
B200	-0.0030	0.0200
C100	-0.0026	0.0339
C200	-0.0010	0.0161
C300	-0.0017	0.0133

By comparing the results for distributions A200, B200, and C200 it was observed that the prediction improved as the points were weighted toward the reflector's edge. This was to be expected since the ability of the spline function to interpolate accurately in the outer perimeter zone is otherwise diminished by an absence of known points outside the reflector boundary.

It was also determined that increasing the number of points used in a similarly weighted distribution (C100, C200, and C300) improved the results. Additionally, it was observed that a properly weighted distribution (C100) was more effective in producing good results than simply using a larger number of points (A200).

Further testing with other distributions indicated that:

(1) Increasing the concentration of a given number of points more heavily in the perimeter zone did not further improve the results beyond that obtained with distributions C200 and C300 and, eventually, worsened the prediction due to a lack of definition in the interior zone.

(2) Increasing the number of points in a similar distribution pattern above 300 did not improve the results significantly enough to warrant the additional complexity, time and memory storage required tc run the program (Section IV).

Figure 6 illustrates the ideal distribution for the known points. As will be discussed in Section III.C, approximately 230 points should be used. Twenty to twenty-five percent of them should be concentrated within the inner 50% of the area of the aperture plane projection and spread uniformly within that area. The remaining 75 to 80% of the points should be distributed uniformly within the outer 50% perimeter zone.

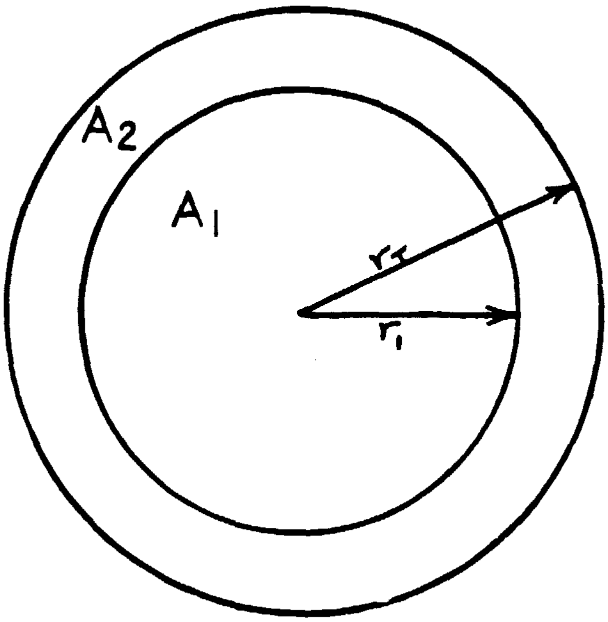
B. Smooth Reflector Performance

A smooth offset paraboloidal reflector (Fig. 7) was constructed at NASA/Langley Research Center and its radiation pattern measured there in the lab. Actual surface extents were also determined at each y, z coordinate for all points used in the five distributions discussed previously (Section III.A).

Program PARSPLN (Section IV) was run using each of the five distributions. The output data of the normalized predictions (Appendix C1) are compared with the measured (solid line) radiation pattern in Figures 8 and 9.

Agreement between measured and predicted results was excellent. The patterns behaved as expected from the surface evaluation studies. Figure 8 shows the general improvement realized as the concentration of points is increased in the outer zone. This improvement is noticed mainly in the sidelobes as the main beam was predicted fairly well by each of the distributions. Departures from this trend noticed in some of the sidelobes are attributed to the repositioning of known points in a certain distribution away from actual points of ray intersections.

Figure 9 shows the improvement due to increasing the number of known points utilized. As in Figure 8 the improvement was noticed mainly in the sidelobes. As in the surface evaluations, increasing the number of points above 200 had only a slight effect on improving the results. Discrepancies in this tendency for larger numbers of points to produce more accurate results were noticed in a few of the sidelobes. Since points were not shifted but simply added in the C distributions to obtain each other, the



$$r_1 = .707\, r_T$$

AREA	CONCENTRATION OF POINTS USED IN PATTERN
A_1 (INNER 50%)	20-25% (UNIFORMLY DISTRIBUTED)
A_2 (OUTER 50%)	75-80% (UNIFORMLY DISTRIBUTED)

Figure 6. Ideal known point distribution.

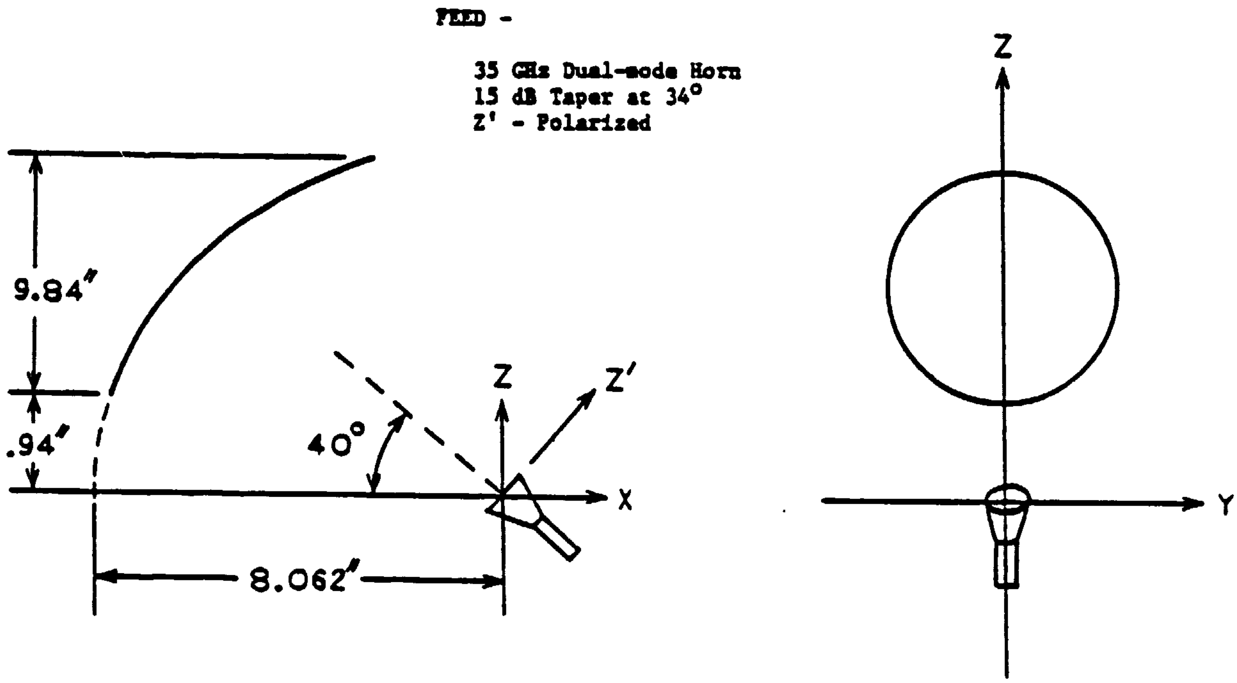


Figure 7. Offset paraboloidal reflector.

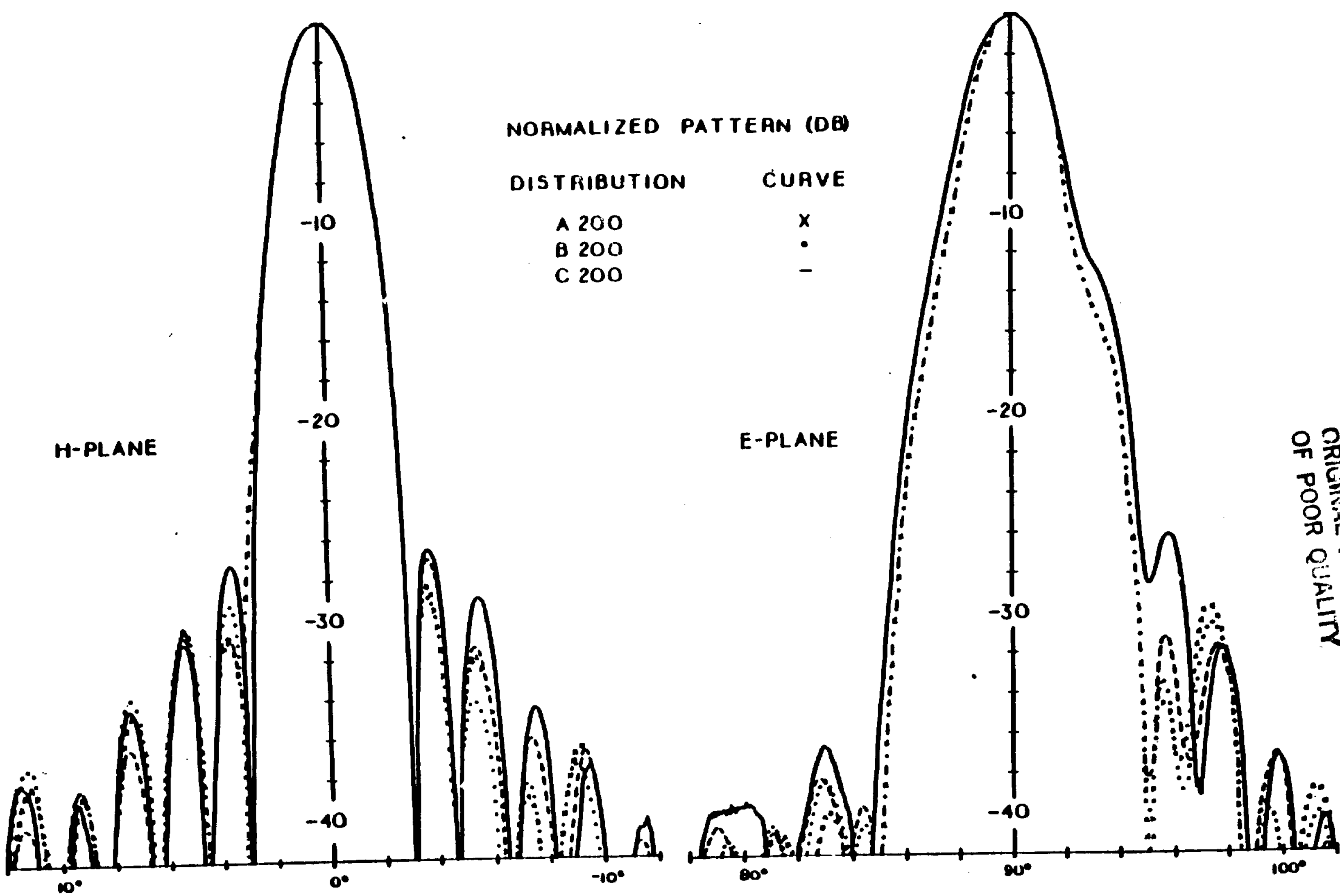


Figure 8. Normalized pattern (DB).

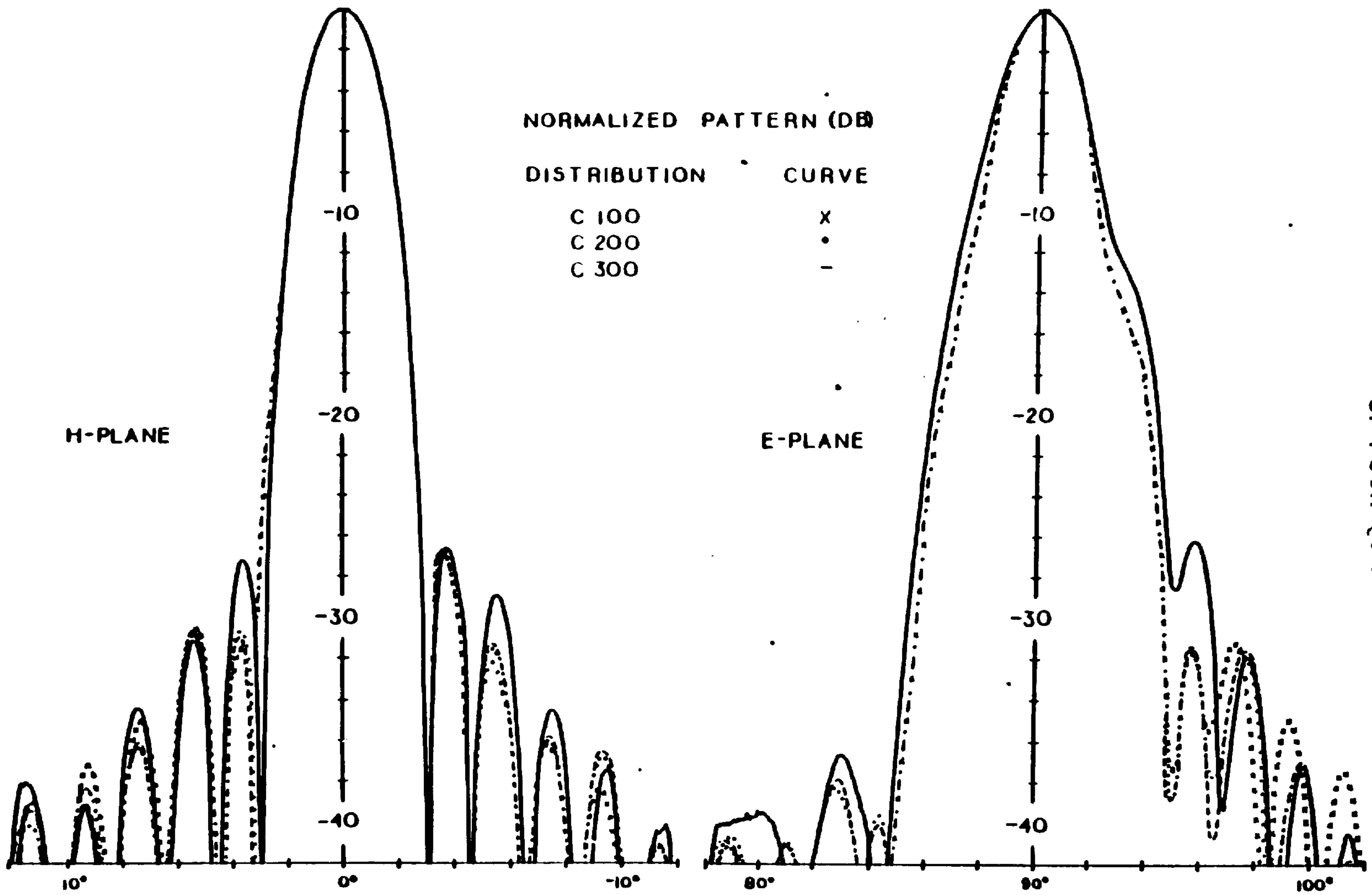


Figure 9. Normalized pattern (DB).

discrepancies are attributed to the quantization and numerical integration procedures of the original program, REFLECTR [5].

To determine the effect of inaccuracies in the surface measurements of the known points, random errors were added to the surface extents of points in a distribution very similar to C200. These random errors were generated by subroutine GETRAN (Appendix E2) and had a normal (Gaussian) distribution with zero mean and unit variance. The predicted radiation patterns using this new distribution were compared with the results obtained before the random error was introduced.

Appendix C2 contains three sets of data. In each set the predicted normalized output (db) before the random error was introduced (2nd column) is listed next to the output after the error was introduced (3rd column) at each angle shown (1st column). Column 4 contains the difference of the two outputs (Column 2 - Column 3).

In the first set of data the random errors were divided by a factor of 10 before being added so as to affect the first decimal place. The resulting pattern was grossly distorted. The second data set shows the effect of measurement errors made in the second decimal position (random errors were divided by 100). The results were still not acceptable. Good results were obtained when measurement errors were limited to the third decimal position (third data set).

C. Distorted Reflector Performance

To simulate the effects that thermal, fabrication and deployment errors might have upon large reflectors erected in space the smooth reflector discussed in Section III.B was distorted by building a small hump into its surface. Modification of the experimental model and subsequent measurements made thereupon were once again performed at Langley Research Center. The resulting radiation pattern is compared to the original in Figure 10.

Points were measured on this new surface and PARSPLN was run using the same distribution (C200) previously found to be successful for the non-distorted reflector. The predicted results (Appendix D1) agreed fairly well

DISTORTED REFLECTOR RADIATION PATTERN

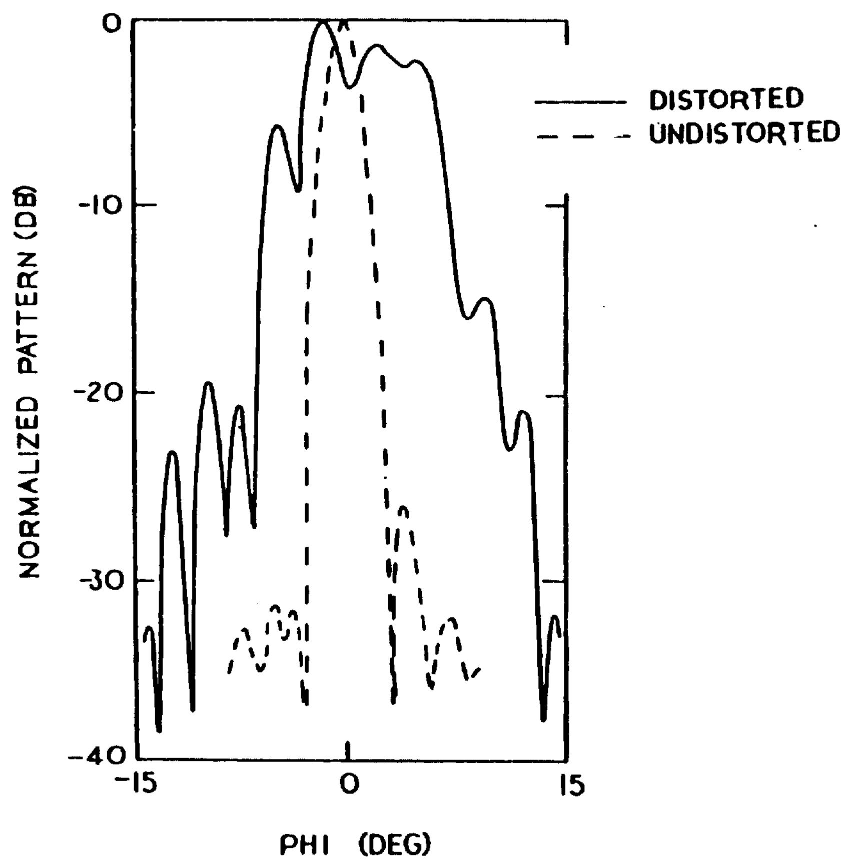


Figure 10. Distorted reflector radiation pattern.

with the measured pattern (Fig. 11) around the center of the beam but lacked definition in some of the lower sidelobes. Increasing the number of measured points from 200 to 232 (distribution C232) remedied this problem (Fig. 11). Distribution C232 was created by adding 32 points to C200 so as to maintain the same percentage concentrations as that of the ideal known point distribution derived in Section III.A.

Distribution C234 (Fig. 12) was created by adding to C200 an additional 34 points concentrated in the vicinity of the known distortion. The radiation patterns obtained (Fig. 12) predicted the results equally as well as those obtained by using distribution C232. Thus, a priori knowledge of the location of the physical distortion was not a prerequisite for successful prediction of the radiation pattern.

PARSPLN was run using distribution C300 for the distorted reflector and the results compared with those using C234 (Appendix D2). Both distributions predicted the results about equally as well. Thus, there is no need to increase the number of points in the ideal distribution above about 235. To do so might possibly involve special programming techniques (Section IV) to deal with the very large memory storage requirements necessitated.

As with the non-distorted reflector, subroutine GETRAN (Appendix E2) was called upon to generate random numbers to be added as measurement errors to the points in the distribution. Appendix D3 lists the coordinate values of all points in distribution C234 (XTRUE, YTRUE, ZTRUE). The coordinate values of the new error distribution (XERR, YERR, ZERR) after the random errors are added are also shown. The final listing shows the output using C234 (DB ORIG) compared with the results predicted by the error distribution (DB ERR). As the difference column (DIFF) indicates no significant degradation results as long as coordinate values are measured accurately to 3 decimal places or about 5 significant figures.

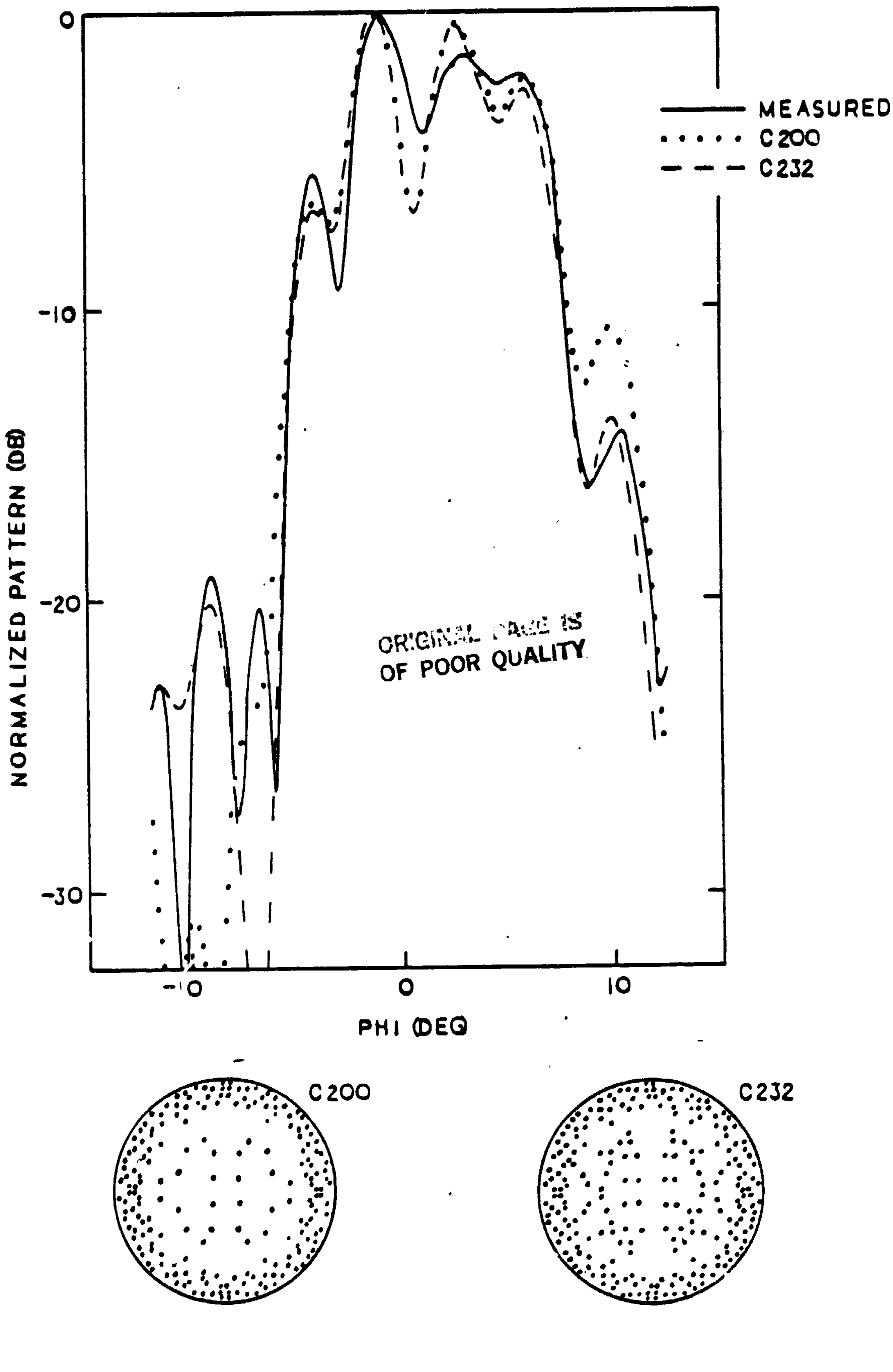


Figure 11. Predicted patterns.

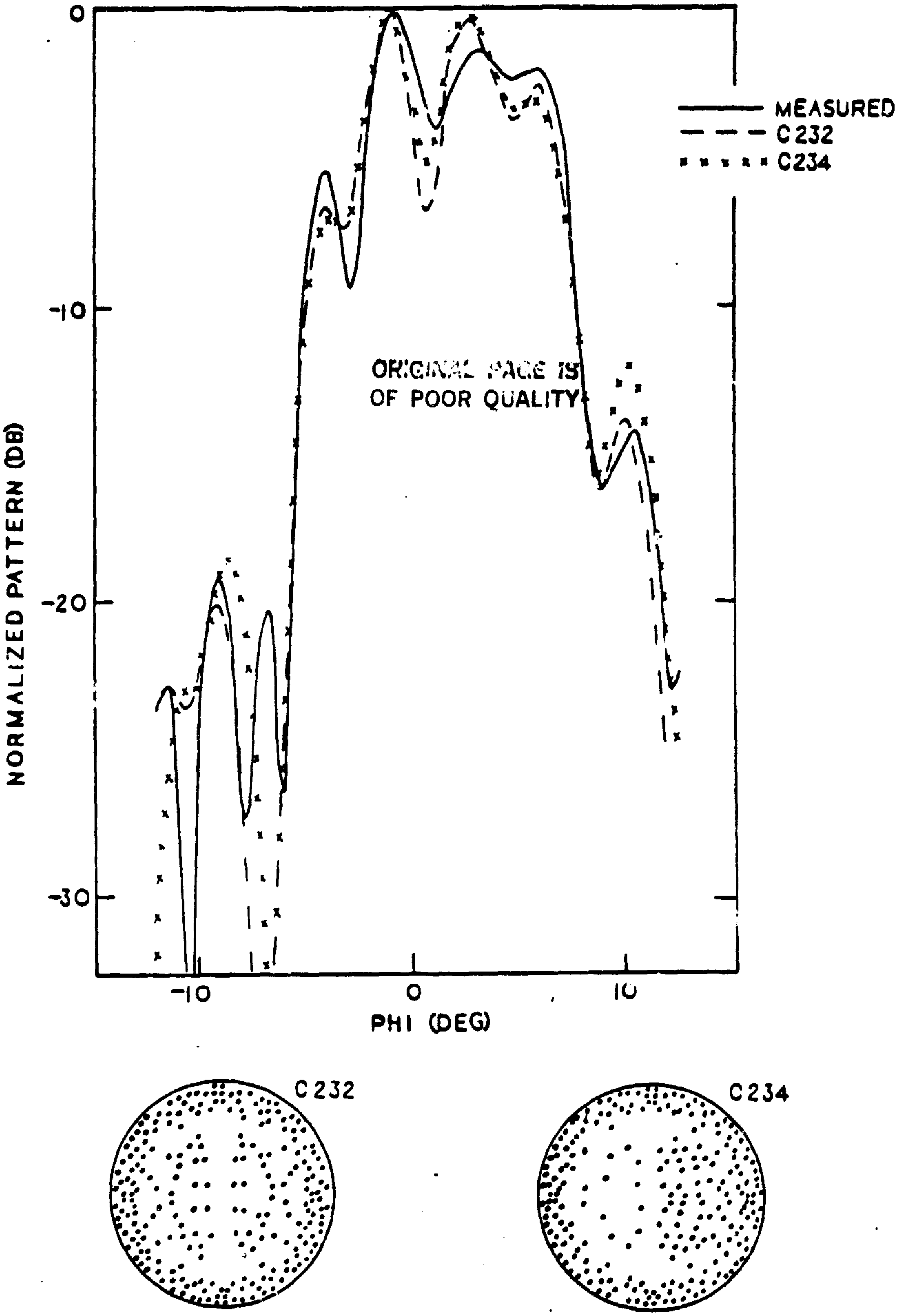


Figure 12. Predicted patterns.

IV. PROGRAMMING

A. Explanation of Files

1. REFLECTR

Original program for the prediction of the radiation patterns of analytical reflectors.

2. SPLINE

a. PROGRAM SPLINE

As a stand-alone program will compute the unknown spline function coefficients for up to 300 known surface points. Requires up to 300K of memory storage (see Table 2).

b. SUBROUTINE SPLINE

Will include one or more of the following three options depending upon into which main program incorporated:

1. Coefficient Determination - Computation of unknown spline function coefficients using up to 234 known surface points.
2. Surface Interpolation - Solution of unknown surface extents at requested y, z coordinates.
3. Surface Differentiation - Computation of partial derivatives at requested y, z coordinates and subsequent determination of unit normal vectors.

3. NRFLCTM

Original REFLECTR program with nonanalytic surface determination included as an option. Unknown surface may be described using up to 234 known points. Selection of this option considerably increases execution time and memory storage requirements over original program (Table 2).

4. NRFLECT

Program NRFLCTM modified to deal with surface descriptions of up to 300 known points. Spline function coefficients must be computed separately using program SPLINE first and then entered as input data. Execution time increased (Table 2).

Table 2. Comparison of files.

File Name	Capabilities	No. Pts Used to Describe Surface	Memory Storage Required (Bytes)	Execution Time* (Octal sec)
REFLECTR	Analytic surfaces only Aperture plane plots Radiation pattern graphs Radiation pattern data	--	260K	220 sec
NRFLCTM	Both analytic and non-analytic surfaces	200 pts	300K	1010 sec
	All capabilities of REFLECTR	234 pts (max)	330K	1170 sec
SPLINE	Spline function coefficients	300 pts (max)	300K	65 sec (1535 sec jointly)
NRFLECT	All capabilities of NRFLCTM (must be used with "SPLINE")	300 pts (max)	300K	1450 sec (1535 sec jointly)
PARSPLN	Non-analytic surface only Radiation pattern data only	234 pts (max)	245K	1300 sec

*Time required to generate and quantize aperture plane data. Total running time (including integration of data) is 260 octal seconds longer for each program.

5. PARSPLN

Program NRFLCTM rewritten to reduce memory storage requirements (Table 2). All analytic surface determinations deleted. Computes spline surface radiation patterns for surface descriptions up to 234 points.

B. Discussion of Programs

1. REFLECTR

A complete discussion of the original theoretical developments [1, 2, 3, 4] as well as a complete description of the program listing, input and output files [5] may be found by consulting the references (Appendix A).

2. SPLINE

Program SPLINE listed in Appendix E3, will compute the unknown spline function coefficients of equation 2 for a surface using up to 300 known points. This upper limit may increased by changing the array dimensions but only in computer systems with memories larger than about 330K.

The array POINT (300, 3) is used to store the known point coordinates which are read in by input loop 100. A value of 999. for x is used as a file marker to signal the end of input data. The number of known points utilized is kept track of by variable K.

SPLINE will produce the K + 3 coefficients required by the spline function (equation 1). The remaining arrays in the dimension statement are required by subroutine GELIM (Appendix E1) for matrix manipulation and must always be dimensioned 3 larger than POINT as must variable NMAX (after statement number 300).

GELIM is called upon to solve for the coefficients after the A and B matrices (Section II.B) are filled and subroutine parameters initialized. Matrix A is filled by quadrants (see equation 4) taking precautions to check for ln 0.

GELIM returns the solution matrix to SPLINE as array B. An output file is created consisting of the N original known point coordinates, file marker 999., followed by the N + 3 spline coefficients.

3. NRFLCTM

Program NRFLCTM requires two input files. Input file 1 (TAPE1) is the original input file of REFLECTR. Setting integer surface code, SURFCE, to 6 [ref. 5, p. 28] will select the spline surface option. Input file 2 (TAPE 2), known point coordinates, is identical to the input file used in SPLINE but must be limited to a maximum of 234 points.

All output options available in REFLECTR are available in NRFLCTM. The spline surface modifications incorporated as an option in NRFLCTM are identical to those in PARSPLN (below) and thus, not discussed here.

4. NRFLECT

Program NRFLECT requires two input files. Input file 1 (TAPE1) is identical to that of NRFLCTM. Input file 2 (TAPE2) is the output file produced by program SPLINE, which must be created prior to running NRFLECT.

Program outputs and spline surface modifications are identical to those in NRFLCTM.

5. PARSPLN

PARSPLN (Appendix F) uses two input files. Input file 1 (TAPE1) is similar to that used in NRFLCTM and REFLECTR except that some extraneous parameters have been deleted. These parameters, having to do with choices between or descriptions of analytical surfaces, were no longer needed since PARSPLN is dedicated to non-analytic reflectors.

A sample input file is presented in Appendix F2. The input variable names shown in the listing for PARSPLN (Appendix F1) are the same ones used in NRFLCTM and are described in detail in the reference for

REFLECTR [5]. The corresponding unmodified input file for NRFLCTM is also shown in Appendix F2 for comparison, and will produce identical results when used with that program.

Input file 2 (TAPE2) is a list of the known point coordinates in the desired surface distribution. The file is identical to the input file

used for program SPLINE except that the number of points must be limited to 234.

The output produced by PARSPLN corresponding to the sample input file of Appendix F2 is shown in Appendix F3.

Subroutine SPLINE is dimensioned to handle 234 points (see Section IV.B2) and is divided into three basic sections. Control is passed by the main program through variable ISP in the computed GO TO statement (third line).

The first call to SPLINE (ISP = 1) is made by PARSPLN to establish the spline function coefficients of equation (2). This occurs just prior to DO LOOP 600. The statements in subroutine SPLINE are identical to those described in program SPLINE earlier (Section IV.B2). No information is transferred back to PARSPLN at this point as the coefficients are stored in the subroutine.

Each time DO LOOP 600 is executed in PARSPLN, parametric equations for a given ray are developed and the successive approximation routine of Fig. 2 is implemented. Calls to SPLINE are made with ISP = 2. Statement 602 in SPLINE begins the interpolation process of equation (1). For each y, z coordinate fed in by the main program, an interpolated x-coordinate value is passed back (XSP). Provisions are made in line 420 of SPLINE to prevent computation of ln 0. Calls to SPLINE with ISP = 2 continue to be made until the approximation procedure for each ray is completed. This accounts for the long execution time of the program.

Once the point of intersection is found, another call to SPLINE is made with ISP = 3. Statement 603 of SPLINE begins the computation of the partial derivatives of equation (3). The values of the unit normal vector components at the requested coordinate are returned to the main program as xx, yy and zz.

V. SUMMARY AND CONCLUSIONS

Accurate predictions of the radiation patterns of arbitrary reflector antennas may be obtained for either smooth or distorted surfaces. A priori knowledge of the location or extent of any surface distortion present is not a prerequisite for obtaining good results.

The arbitrary reflector must be described by a set of points measured on the surface. The points should be chosen according to Fig. 6 such that 20-25% of them are uniformly distributed within the inner 50% of the area of the reflector's aperture plane projection, and the remaining 75-80% uniformly distributed within the outer 50% perimeter zone. Weighting the distribution less heavily in the perimeter zone would result in less accurate results since this outer area would not be adequately described, and weighting the distribution more heavily in this zone would likewise result in less accurate predictions since the inner area description would be insufficient.

The number of points utilized should be about 230. Although good predictions can still be achieved with 200 points, some inaccuracies in the description of the lower sidelobes become apparent below this number. Results obtained with distributions above 230 points are not significantly more accurate and require special program handling techniques for computers with memory capacities below 330K.

All three coordinates of the points used to describe the surface should be measured accurately to 5 significant figures.

Program PARSPLN takes about 1500 octal seconds to run and requires about 250K of memory storage.

APPENDIX A

REFERENCES

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APPENDIX B

SURFACE EVALUATIONS

Distribution A200.

Y	X	TRUE Z	SPLINE Z	TRU-SPL	PERC ERR(%)
.50000	6.36000	-6.79992	-6.79995	.00000	-.00002
-.50000	6.36000	-6.79993	-6.79991	-.00001	.00008
.50000	5.36000	-7.16335	-7.16333	.00000	-.00006
-.50000	5.36000	-7.16335	-7.16335	.00000	.00001
1.50000	6.36000	-6.73790	-6.73789	-.00001	.00013
-1.50000	6.36000	-6.73790	-6.73790	.00000	.00007
1.50000	5.36000	-7.10133	-7.10133	.00000	.00006
-1.50000	5.36000	-7.10133	-7.10133	.00000	-.00002
2.50000	6.36000	-6.61386	-6.61384	-.00002	.00034
-2.50000	6.36000	-6.61386	-6.61383	-.00003	.00043
2.50000	5.36000	-6.97729	-6.97727	-.00002	.00031
-2.50000	5.36000	-6.97729	-6.97727	-.00002	.00033
3.50000	6.36000	-6.42780	-6.42821	.00041	-.00642
-3.50000	6.36000	-6.42780	-6.42319	.00039	-.00611
3.50000	5.36000	-6.79124	-6.79165	.00041	-.00600
-3.50000	5.36000	-6.79124	-6.79163	.00037	-.00572
4.50000	6.36000	-6.17973	-6.17695	-.00278	.04501
-4.50000	6.36000	-6.17973	-6.17697	-.00276	.04460
4.50000	5.36000	-6.54316	-6.54018	-.00298	.04556
-4.50000	5.36000	-6.54316	-6.54040	-.00276	.04222
.50000	7.36000	-6.37447	-6.37447	.00000	.00001
-.50000	7.36000	-6.37447	-6.37447	.00000	.00008
.50000	4.36000	-7.46477	-7.46477	-.00000	.00000
-.50000	4.36000	-7.46477	-7.46477	-.00000	.00004
1.50000	7.36000	-6.31249	-6.31245	.00000	-.00003
-1.50000	7.36000	-6.31248	-6.31248	-.00000	.00003
1.50000	4.36000	-7.40273	-7.40273	-.00000	.00006
-1.50000	4.36000	-7.40273	-7.40273	.00000	-.00006
2.50000	7.36000	-6.18841	-6.18839	-.00002	.00028
-2.50000	7.36000	-6.18841	-6.18839	-.00002	.00032
2.50000	4.36000	-7.27871	-7.27870	-.00001	.00016
-2.50000	4.36000	-7.27871	-7.27869	-.00002	.00022
3.50000	7.36000	-6.00235	-6.00272	.00037	-.00620
-3.50000	7.36000	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	4.36000	-7.09265	-7.09302	.00037	-.00519
-3.50000	4.36000	-7.09265	-7.09302	.00037	-.00519
4.50000	7.36000	[illegible]	[illegible]	[illegible]	[illegible]
-4.50000	7.36000	-5.75427	-5.73602	-.00175	-.03042
4.50000	4.36000	-6.84467	-6.84664	.00207	-.03026
-4.50000	4.36000	-6.84467	[illegible]	[illegible]	[illegible]
.50000	8.36000	-5.88699	-5.88697	-.00002	.00040
-.50000	8.36000	-5.88699	-5.88697	-.00002	.00034
.50000	3.36000	-7.70416	-7.70412	-.00004	.00048
-.50000	3.36000	-7.70416	-7.70413	-.00003	.00043
1.50000	8.36000	-5.82497	-5.82497	-.00000	.00007
-1.50000	8.36000	[illegible]	-5.82489	[illegible]	[illegible]
1.50000	3.36000	-7.64214	-7.64211	-.00003	.00041
-1.50000	3.36000	-7.64214	-7.64205	-.00009	.00114
2.50000	8.36000	-5.70094	-5.70122	.00027	-.00477
-2.50000	8.36000	-5.70094	-5.70120	.00026	-.00459
2.50000	3.36000	-7.51810	-7.51837	.00027	-.00366
-2.50000	3.36000	-7.51810	-7.51839	.00029	-.00387
3.50000	8.36000	-5.51488	-5.51315	-.00173	.03137
-3.50000	8.36000	-5.51488	-5.51315	-.00173	.03145
3.50000	3.36000	-7.33204	-7.33033	-.00171	.02334
-3.50000	3.36000	-7.33204	-7.33032	-.00172	.02342
.50000	9.36000	-5.33750	-5.33813	.00063	-.01178
-.50000	9.36000	-5.33750	-5.33815	.00065	-.01217
.50000	2.36000	-7.88154	-7.88221	.00067	-.00846
-.50000	2.36000	-7.88154	-7.88219	.00065	-.00827
1.50000	9.36000	-5.27548	-5.27619	.00071	-.01342
-1.50000	9.36000	-5.27548	-5.27617	.00069	-.01308
1.50000	2.36000	-7.81952	-7.81998	.00046	-.00588
-1.50000	2.36000	-7.81952	-7.82019	.00067	-.00861
2.50000	9.36000	-5.15144	-5.15077	-.00067	.01295
-2.50000	9.36000	-5.15144	-5.15083	-.00061	.01196
2.50000	2.36000	-7.69548	-7.69480	-.00068	.00889
-2.50000	2.36000	-7.69548	-7.69471	-.00077	.01003
3.20000	9.06000	-5.19908	-5.19770	-.00138	.02662
-3.20000	9.06000	-5.19908	-5.19756	[illegible]	[illegible]
3.20000	2.66000	-7.22505	-7.22362	-.00143	.01998
-3.20000	2.66000	-7.22505	-7.22362	-.00143	.01998
.50000	10.36000	-4.72599	-4.72246	-.00353	.07470
-.50000	10.36000	-4.72599	-4.72245	-.00354	.07491
.50000	1.36000	-7.99689	-7.99287	-.00402	.05030
-.50000	1.36000	-7.99689	-7.99232	-.00457	[illegible]
1.50000	10.36000	-4.66397	-4.66528	.00131	-.02817
-1.50000	10.36000	-4.66397	-4.66529	.00132	-.02829
1.50000	1.36000	-7.93487	-7.93664	.00177	-.02230
-1.50000	1.36000	-7.93487	-7.93672	.00185	-.02328
4.50000	6.36000	-6.17973	-6.17695	-.00278	.04501
-4.50000	6.36000	-6.17973	-6.17697	-.00276	.04460
4.50000	5.36000	-6.54316	-6.54018	-.00299	[illegible]
-4.50000	5.36000	-6.54315	-6.54040	-.00276	[illegible]
4.60000	7.36000	[illegible]	-5.73047	.00442	-.07717
-4.60000	7.36000	-5.72605	-5.73040	.00435	[illegible]
4.60000	4.36000	[illegible]	-6.82113	.00478	[illegible]
-4.60000	4.36000	-6.81633	[illegible]	[illegible]	[illegible]
3.80000	7.86000	-5.69845	-5.69737	-.00108	[illegible]
-3.80000	7.86000	-5.69845	-5.69737	-.00108	.01894
3.80000	3.86000	-7.15219	-7.15098	-.00121	.01690
-3.80000	3.86000	-7.15219	-7.15098	[illegible]	.01696
3.80000	8.86000	-5.17997	[illegible]	[illegible]	[illegible]
-3.80000	8.86000	-5.17997	-5.18729	.00732	-.14130
3.80000	2.86000	-7.36057	-7.36834	.00777	[illegible]
-3.80000	2.86000	-7.36057	[illegible]	[illegible]	[illegible]
2.80000	9.06000	-5.27350	-5.27300	-.00050	.00946
-2.80000	9.06000	-5.27350	-5.27262	-.00088	.01670
2.80000	2.46000	[illegible]	[illegible]	[illegible]	[illegible]
-2.80000	2.46000	-7.59947	-7.59857	-.00090	.01178
2.80000	9.76000	-4.84498	-4.84684	.00186	-.03820
-2.80000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.80000	1.76000	-7.69976	-7.70205	.00229	-.02979
-2.80000	1.76000	-7.69976	-7.70210	.00234	-.03039
2.20000	9.56000	[illegible]	[illegible]	[illegible]	.04446
-2.20000	9.56000	-5.07783	-5.07566	-.00217	.04312
2.20000	2.16000	-7.76727	[illegible]	-.00169	[illegible]
-2.20000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.80000	10.36000	-4.63327	-4.63744	.00417	[illegible]
-1.80000	10.36000	-4.63327	[illegible]	.00417	[illegible]
1.80000	1.36000	-7.90417	-7.90909	[illegible]	[illegible]
-1.80000	1.36000	-7.90417	-7.90911	.00494	[illegible]
.80000	10.66000	-4.51835	-4.52277	.00442	-.09779
-.80000	10.66000	[illegible]	[illegible]	[illegible]	[illegible]
.30000	1.06000	-8.00731	-8.01165	.00434	[illegible]
-.30000	1.06000	-8.00731	[illegible]	[illegible]	[illegible]
.50000	10.36000	[illegible]	[illegible]	[illegible]	[illegible]
-.50000	10.36000	-4.72599	-4.72245	-.00354	.07491
.50000	1.36000	-7.99489	-7.99287	-.00402	.05030
-.50000	1.36000	-7.99489	[illegible]	[illegible]	[illegible]

ORIGINAL PAGE IS
OF POOR QUALITY

Distribution B200.

ORIGINAL PAGE IS
OF POOR QUALITY

Y	Z	TRUE A	SPLINE A	[illegible]	ERR [illegible]
.50000	6.36000	-6.79992	-6.79992	.00000	-.00000
-.50000	6.36000	-6.79992	-6.79991	-.00001	.00008
.50000	5.36000	-7.16337	-7.16337	-.00000	.00000
-.50000	5.36000	[illegible]	[illegible]	.00000	-.00005
1.50000	6.36000	-6.77770	-6.77770	.00000	-.00007
-1.50000	6.36000	-6.77770	-6.77770	.00007	-.00005
1.50000	5.36000	-7.10133	-7.10133	.00000	.00003
-1.50000	5.36000	-7.10133	-7.10133	.00000	-.00006
2.50000	6.36000	-6.61384	-6.61384	-.00040	.00006
-2.50000	[illegible]	[illegible]	[illegible]	[illegible]	.00002
2.50000	9.36000	-6.97729	-6.77729	-.00000	.00001
-2.50000	9.36000	-6.77729	-6.77729	-.00000	.00001
3.50000	6.36000	-6.42700	-6.42777	-.00003	.00054
-3.50000	6.36000	-6.42790	-6.42776	-.00004	.00052
3.50000	5.36000	-6.79124	-6.79120	-.00004	.00065
-3.50000	5.36000	[illegible]	[illegible]	[illegible]	.00066
4.50000	6.36000	-6.17973	-6.17903	-.00070	.01126
-4.50000	6.36000	-6.17973	-6.17899	-.00075	.01213
4.50000	5.36000	-6.54316	[illegible]	[illegible]	.01173
-4.50000	5.36000	-6.54316	-6.54229	-.00087	.01329
.50000	7.36000	-6.37447	-6.37447	-.00000	.00003
-.50000	[illegible]	[illegible]	[illegible]	[illegible]	.00012
.50000	4.36000	-7.46477	-7.46476	-.00001	.00009
-.50000	4.36000	-7.46477	-7.46475	-.00001	.00010
1.50000	7.36000	[illegible]	[illegible]	[illegible]	-.00013
-1.50000	7.36000	-6.31245	-6.31247	.00002	-.00026
1.50000	4.36000	-7.40275	-7.40276	.00001	-.00018
-1.50000	4.36000	-7.40275	[illegible]	[illegible]	-.00022
2.50000	7.36000	-6.18841	-6.18839	-.00002	.00031
-2.50000	7.36000	-6.18841	-6.18839	-.00002	.00031
2.50000	4.36000	-7.27871	-7.27868	-.00003	.00034
-2.50000	4.36000	-7.27871	-7.27869	-.00002	.00030
3.50000	7.36000	-6.30235	-6.30266	.00031	-.00511
-3.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	4.36000	-7.39265	-7.39294	.00029	-.00409
-3.50000	4.36000	-7.39265	-7.39294	.00029	-.00406
4.50000	7.36000	[illegible]	[illegible]	[illegible]	.02493
-4.50000	7.36000	-5.75427	[illegible]	-.00128	.02291
4.50000	4.36000	-6.84497	-6.84353	-.00104	.01524
-4.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	8.36000	-5.38499	-5.38790	.00001	-.00019
-.50000	8.36000	-5.38499	-5.38790	.00001	-.00014
.50000	3.36000	-7.70416	-7.70416	.00000	-.00002
-.50000	3.36000	-7.70416	-7.70416	.00000	-.00003
1.50000	3.36000	-5.32497	-5.32474	-.00003	.00044
-1.50000	[illegible]	[illegible]	[illegible]	[illegible]	.00047
1.50000	3.36000	[illegible]	[illegible]	-.00003	.00039
-1.50000	3.36000	-7.54224	-7.54211	-.00003	.00033
2.50000	8.36000	-5.70094	-5.70092	-.00002	.00027
-2.50000	8.36000	-5.70094	-5.70093	-.00001	.00017
2.50000	3.36000	-7.51810	-7.51310	-.00000	.00034
-2.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	8.36000	-5.51488	-5.51484	-.00004	.00080
-3.50000	8.36000	-5.51488	-5.51487	-.00001	.00073
3.50000	3.36000	-7.33204	-7.33197	-.00007	.00099
-3.50000	3.36000	-7.33204	-7.33197	-.00007	.00098
.50000	9.36000	-5.33738	-5.33740	.00012	-.00187
-.50000	9.36000	-5.33726	-5.33714	.00011	-.00170
.50000	2.36000	-7.88154	-7.88143	.00009	-.00120
-.50000	2.36000	-7.88154	-7.88154	-.00000	.00001
1.50000	9.36000	-5.27748	-5.27747	.00018	-.00257
-1.50000	9.36000	-5.27748	-5.27760	.00012	-.00236
1.50000	2.36000	-7.81952	-7.81979	.00018	-.00233
-1.50000	2.36000	-7.81952	-7.81979	.00027	-.00344
2.50000	9.36000	-5.15144	-5.15116	-.00027	.00537
-2.50000	9.36000	-5.15144	-5.15114	-.00030	.00579
2.50000	2.36000	-7.49548	-7.49512	-.00036	.00464
-2.50000	2.36000	-7.49548	-7.49513	-.00035	.00459
3.50000	9.36000	-5.19909	-5.19822	-.00087	.01675
-3.50000	9.36000	-5.19909	[illegible]	[illegible]	.01424
3.50000	2.36000	-7.52505	-7.52414	-.00071	.01733
-3.50000	2.36000	-7.52505	-7.52415	-.00090	.01196
.50000	10.36000	-4.72599	-4.72543	-.00056	.01192
-.50000	10.36000	-4.72590	-4.72540	-.00051	.01076
.50000	1.36000	-7.99679	-7.99631	-.00029	.00774
-.50000	1.36000	-7.99689	-7.99622	-.00068	.00854
1.50000	10.36000	-4.46397	-4.46523	.00128	-.02774
-1.50000	10.36000	-4.46377	-4.46521	.00125	-.02454
1.50000	1.36000	-7.93487	-7.93652	.00164	-.02073
-1.50000	1.36000	-7.93487	-7.93384	-.00103	.01305
4.50000	6.36000	-6.17973	[illegible]	-.00079	.01175
-4.50000	6.36000	-6.17973	-6.17896	-.00077	.01217
4.50000	5.36000	-6.54316	-6.54239	-.00077	.01173
-4.50000	5.36000	-6.54316	-6.54229	-.00087	.01329
4.60000	7.36000	[illegible]	-5.72588	-.00023	.00399
-4.60000	7.36000	-5.72606	-5.72593	-.00012	.00211
4.60000	4.36000	-6.81635	-6.81673	.00038	-.00590
-4.60000	4.36000	-6.81635	-6.81487	.00048	-.00709
3.80000	7.86000	-5.69848	-5.69888	.00013	[illegible]
-3.80000	7.86000	-5.69848	-5.69858	.00013	-.00227
3.80000	3.86000	-7.15219	-7.15228	.00009	-.00123
-3.80000	3.86000	-7.15219	-7.15227	.00008	-.00108
3.80000	8.86000	-5.17999	[illegible]	.00338	-.06529
-3.80000	8.86000	-5.17999	-5.18508	.00511	-.08999
3.80000	2.86000	-7.34087	-7.34481	.00424	-.05773
-3.80000	[illegible]	-7.34087	-7.34462	.00405	-.05734
2.80000	9.06000	-5.27390	-5.27334	.00004	-.00077
-2.80000	9.06000	-5.27390	-5.27383	.00007	-.00066
2.80000	2.44000	-7.59947	-7.59942	-.00005	.00062
-2.80000	2.44000	-7.59947	-7.59942	-.00005	.00062
2.30000	9.74000	-4.84490	-4.84444	-.00052	.01048
-2.30000	9.74000	-4.88494	-4.88311	-.00187	.03297
2.30000	1.96000	-7.69976	-7.69944	-.00032	.00414
-2.30000	1.96000	-7.69976	-7.67994	-.00077	.00787
2.20000	9.38000	-5.07785	-5.07772	[illegible]	.00184
-2.20000	9.36000	-5.07785	-5.07798	.00012	-.00240
2.20000	2.16000	-7.74723	-7.74712	-.00011	.00177
-2.20000	2.16000	-7.74723	-7.74710	-.00013	.00184
1.30000	10.36000	-4.63327	-4.63408	.00081	-.04057
-1.30000	10.36000	-4.63327	-4.63587	.00260	-.05432
1.30000	1.36000	-7.90417	-7.90791	.00374	-.04222
-1.30000	1.36000	-7.90417	-7.90429	.00012	-.00158
.80000	10.66000	-4.31838	[illegible]	.00373	-.08695
-.80000	10.66000	[illegible]	[illegible]	[illegible]	[illegible]
.30000	1.36000	-8.30771	-8.31174	.00443	-.05337
-.30000	1.36000	-8.30731	-8.30811	.00080	-.00995
.50000	10.36000	[illegible]	[illegible]	-.00056	.01192
-.50000	10.36000	-4.72599	-4.72540	-.00051	.01074
.50000	1.36000	-7.99689	-7.99631	-.00058	.00773
-.50000	1.36000	-7.99689	[illegible]	[illegible]	.00854

Distribution C100.

[illegible]	[illegible]	TRUE [illegible]	[illegible]	[illegible]	ERROR
.50000	[illegible].36000	-4.29992	-4.29995	.00004	-.00053
-.50000	[illegible].36000	-4.29992	-4.29996	.00004	-.00060
.50000	2.36000	-7.16332	-7.16339	.00004	-.00052
-.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.50000	6.36000	-4.77799	[illegible]	-.00017	.00277
-1.50000	6.36000	-4.77790	-4.77770	-.00020	.00295
1.50000	2.36000	-7.10133	-7.10114	-.00017	.00264
-1.50000	2.36000	-7.10133	-7.10114	-.00019	.00264
2.50000	6.36000	-6.61386	-6.61420	.00034	-.00521
-2.50000	6.36000	-6.61386	-6.61423	.00037	-.00550
2.50000	5.36000	-6.77729	-6.77762	.00033	-.00466
-2.50000	5.36000	-6.77729	-6.77746	.00037	-.00534
3.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-3.50000	6.36000	-6.42780	-6.42778	.00150	-.02371
3.50000	3.36000	-6.79124	-6.79259	.00135	-.01990
-3.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.50000	6.36000	-6.17773	-6.17439	-.00334	.05399
-4.50000	6.36000	-6.17773	-6.17618	-.00355	.05744
4.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4.50000	5.36000	-6.54316	-6.53921	-.00395	.06034
.50000	7.36000	-6.37447	-6.37424	-.00023	.00364
-.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	4.36000	-7.44477	-7.44456	-.00021	.00281
-.50000	4.36000	-7.44477	-7.44456	-.00021	.00284
1.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-1.50000	7.36000	-6.31245	-6.31226	-.00019	.00302
1.50000	4.36000	-7.40275	-7.40264	-.00011	.00149
-1.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.50000	7.36000	-6.18841	-6.18905	.00064	-.01031
-2.50000	7.36000	-6.18841	-6.18915	.00074	-.011[illegible]
2.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.50000	4.36000	-7.27871	-7.27946	.00075	-.01032
3.50000	7.36000	-6.00235	-6.00261	.00026	-.00426
-3.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	4.36000	-7.09265	-7.09291	.00026	-.00371
-3.50000	4.36000	-7.09265	-7.09291	.00026	-.00367
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4.50000	7.36000	-5.75427	-5.75577	.00150	-.02602
4.50000	4.36000	-6.84457	-6.84619	.00162	-.02367
-4.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	8.36000	-5.38699	-5.38753	.00054	-.00940
-.50000	3.36000	-5.38699	-5.38753	.00054	-.00951
.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-.50000	3.36000	-7.70414	-7.70477	.00061	-.00776
1.50000	8.36000	-5.82497	-5.82502	.00005	-.00096
-1.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.50000	3.36000	-7.64214	-7.64222	.00008	-.00127
-1.50000	3.36000	-7.64214	-7.64221	.00007	-.00089
2.50000	[illegible]	[illegible]	[illegible]	.00106	[illegible]
-2.50000	8.36000	-5.77094	-5.77205	.00111	-.01944
2.50000	3.36000	-7.51810	-7.51958	.00148	-.01756
-2.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	8.36000	-5.51488	-5.51341	-.00147	.02673
-3.50000	8.36000	-5.51488	-5.51339	-.00149	.02698
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-3.50000	3.36000	-7.33204	-7.33087	-.00148	.01980
.50000	9.36000	-5.33750	-5.33776	.00274	-.03266
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	2.34000	-7.88154	-7.88327	.00173	-.02198
-.50000	2.34000	-7.88154	-7.88327	.00173	-.02198
1.50000	[illegible]	[illegible]	-5.27691	.00143	-.02712
-1.50000	9.36000	-5.27548	-5.27693	.00145	-.02734
1.50000	2.36000	-7.81957	-7.82077	.00157	-.01627
-1.50000	[illegible]	-7.81955	-7.82080	.00125	-.01628
2.50000	9.36000	-5.15144	-5.15090	-.00054	.01052
-2.50000	9.36000	-5.15144	-5.15099	-.00055	.01062
2.50000	2.34000	-7.69548	-7.69486	-.00062	.00807
-2.50000	2.36000	-7.69548	-7.69487	-.00081	.00796
3.50000	9.06000	-5.19908	-5.19687	-.00221	.04245
-3.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	2.66000	-7.52505	-7.52056	-.00449	.05762
-3.50000	2.66000	-7.52505	-7.52066	-.00439	.05836
.50000	10.36000	-4.72599	-4.72462	-.00137	.02900
-.50000	10.36000	-4.72599	-4.72441	-.00138	.02925
.50000	1.36000	-7.99689	-7.99572	-.00117	.01464
-.50000	1.36000	[illegible]	-7.99571	-.00111	.01473
1.50000	10.36000	-4.66397	-4.66390	-.00007	.00160
-1.50000	10.36000	-4.66397	-4.66383	-.00014	.00297
1.50000	1.36000	-7.93487	-7.93523	.00036	-.00486
-1.50000	1.36000	-7.93487	-7.93523	.00036	-.00482
4.50000	6.36000	-6.17773	-6.17439	-.00334	.05399
-4.50000	6.36000	-6.17773	-6.17618	-.00355	.05744
4.50000	5.36000	-6.54316	-6.54021	-.00295	.04503
-4.50000	5.36000	-6.54316	[illegible]	-.00375	[illegible]
4.60000	7.36000	-5.72608	-5.72880	.00248	-.04273
-4.60000	7.36000	-5.72608	-5.73020	.00413	-.07248
4.60000	4.36000	-6.81635	-6.82079	.00444	-.06520
-4.60000	4.36000	-6.81635	-6.82917	.00782	-.04131
3.80000	7.86000	-5.49848	-5.69665	-.00189	.03148
-3.80000	[illegible]	[illegible]	[illegible]	-.00178	[illegible]
3.80000	3.86000	-7.15219	-7.15017	-.00203	.02803
-3.80000	3.86000	-7.15219	-7.15037	-.00182	.02538
3.80000	8.86000	-5.17997	-5.17978	-.00019	.00367
-3.80000	8.86000	-5.17997	-5.17978	-.00019	.00368
3.80000	2.86000	-7.36087	-7.36070	.00013	-.00180
-3.80000	[illegible]	-7.36087	-7.36070	.00013	[illegible]
2.80000	9.06000	-5.27380	-5.27782	-.00048	.01278
-2.80000	9.06000	-5.27330	-5.27381	-.00049	.01208
2.30000	[illegible]	-7.59947	-7.59810	-.00137	.01797
-2.40000	2.46000	-7.59947	-7.59814	-.00133	.01748
2.30000	9.76000	-4.36478	-4.84977	.00427	-.08[illegible]
-2.30000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.30000	1.76003	-7.69976	-7.70277	.00297	-.03859
-2.30000	1.76000	-7.69976	-7.70290	.00304	-.03772
2.20000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.20000	9.36000	-5.37783	-5.37672	-.00111	.02181
2.20000	2.16000	-7.76723	-7.76642	-.00081	.01042
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.30000	10.36000	-4.63327	-4.63429	.00102	-.02200
-1.30000	10.36000	-4.63327	-4.63423	.00079	-.02117
1.30000	1.36000	[illegible]	[illegible]	.00159	-.02016
-1.30000	1.36000	-7.90417	-7.90576	.00159	-.02011
.30000	10.66000	-4.31835	-4.32424	.00589	-.13637
-.30000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.30000	1.06000	-9.00731	-9.01388	.00657	-.07210
-.30000	1.06000	-9.00731	-9.01388	.00657	-.07204
.50000	10.36000	[illegible]	[illegible]	[illegible]	.02900
-.50000	10.36000	-4.72599	-4.72441	-.00138	.02725
.50000	1.36000	-7.99689	-7.99572	-.00117	.01464
-.50000	[illegible]	[illegible]	[illegible]	[illegible]	.01473

Distribution C200.

ORIGINAL PAGE IS OF POOR QUALITY

[illegible]	[illegible]	TRUE F	SPLINE F	TRU-SPL	[illegible]
.50000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-.30000	6.36000	-6.79992	-6.79992	-.00000	.00003
.50000	5.36000	-7.16335	-7.16335	-.00000	.00001
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.50000	6.36000	-6.73790	-6.73774	.00004	-.00055
-1.50000	6.36000	-6.73790	-6.73793	.00003	-.00052
1.50000	7.36000	-7.10133	-7.10137	.00004	-.00029
-1.50000	5.36000	-7.10133	-7.10137	.00004	-.00057
2.50000	6.36000	-6.61296	-6.61286	.00000	-.00005
-2.50000	5.36000	-6.61286	-6.61287	.00001	-.00012
2.50000	5.36000	-6.77729	-6.77730	.00001	-.00009
-2.50000	5.36000	-6.77729	-6.77731	.00003	-.00024
[illegible]	[illegible]	[illegible]	[illegible]	.00003	[illegible]
-3.50000	6.36000	-6.42730	-6.42735	.00001	-.00016
3.50000	5.36000	-6.79124	-6.79130	.00006	-.00090
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.50000	6.36000	-6.17973	-6.17957	-.00016	.00267
-4.50000	6.36000	-6.17973	-6.17949	-.00024	.00383
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4.50000	5.36000	-6.54316	-6.54320	.00004	-.00064
.50000	7.36000	-6.37447	-6.37446	-.00001	.00008
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	4.36000	-7.44677	-7.44676	-.00001	.00014
-.50000	4.36000	-7.44677	-7.44676	-.00001	.00010
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-1.50000	7.36000	-6.31245	-6.31245	.00000	-.00001
1.50000	4.36000	-7.40273	-7.40273	-.00000	.00003
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.50000	7.36000	-6.13841	-6.13824	-.00015	.00279
-2.50000	7.36000	-6.13841	-6.13826	-.00015	.00244
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.50000	4.36000	-7.27971	-7.27958	-.00014	.00214
3.50000	7.36000	-6.00225	-6.00224	-.00001	.00019
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	4.36000	-7.09265	-7.09265	-.00000	.00002
-3.50000	4.36000	-7.09265	-7.09264	-.00001	.00017
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4.50000	7.36000	-5.75427	[illegible]	.00047	-.00735
4.50000	4.36000	-6.84057	[illegible]	.00040	-.00081
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	8.36000	-5.88699	-5.88696	-.00003	.00055
-.50000	8.36000	-5.88699	-5.88696	-.00003	.00051
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-.50000	3.36000	-7.73416	-7.73415	-.00001	.00010
1.50000	8.36000	-5.82497	-5.82495	-.00002	.00041
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.50000	3.36000	-7.64214	-7.64212	-.00002	.00032
-1.50000	3.36000	-7.64214	-7.64211	-.00003	.00039
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.50000	8.36000	-5.73094	[illegible]	.00022	-.00362
2.50000	3.36000	-7.51912	[illegible]	.00072	-.00422
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	8.36000	-5.51408	-5.51413	-.00075	.01359
-3.50000	8.36000	-5.51408	-5.51413	-.00075	.01366
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02078
.50000	9.36000	-5.33730	[illegible]	-.00000	.00048
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.50000	2.36000	-7.38154	-7.38157	.00003	-.00045
-.50000	2.36000	-7.38154	-7.38159	.00005	-.00064
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-1.50000	9.36000	-5.27540	[illegible]	.00024	-.00461
1.50000	2.36000	-7.31952	[illegible]	.00019	-.00240
-1.50000	2.36000	-7.31952	-7.31972	[illegible]	[illegible]
2.50000	9.36000	-5.15140	-5.15109	-.00033	.00476
-2.50000	9.36000	-5.15144	-5.15109	-.00033	.00479
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.50000	2.36000	-7.69548	-7.69516	-.00032	.00412
3.50000	9.36000	-5.19908	[illegible]	-.00085	.01640
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.50000	2.46000	-7.55208	-7.55231	-.00254	.03378
-3.50000	2.46000	-7.55209	-7.55226	-.00249	.03312
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-.50000	10.36000	-4.75299	-4.75270	-.00029	.00620
.50000	1.36000	-7.79687	[illegible]	-.00115	.01436
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.50000	10.36000	-4.64397	-4.64223	-.00174	.03721
-1.50000	10.36000	-4.64397	-4.64219	-.00182	[illegible]
1.50000	1.36000	-7.73487	-7.73393	-.00094	.01181
-1.50000	1.36000	-7.77487	-7.77439	-.00048	.00604
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4.50000	6.36000	-6.17972	[illegible]	[illegible]	[illegible]
4.50000	5.36000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.60000	7.36000	[illegible]	-5.72469	.00064	-.01114
-4.60000	7.36000	[illegible]	[illegible]	.00232	-.04048
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-4.60000	4.36000	[illegible]	[illegible]	[illegible]	[illegible]
3.80000	7.86000	-5.49047	[illegible]	-.00007	.00121
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.80000	3.86000	-7.15219	-7.15212	-.00007	.00097
-3.80000	3.86000	-7.15219	-7.15223	.00004	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-3.80000	8.86000	-5.17997	[illegible]	[illegible]	.00314
3.80000	3.86000	[illegible]	-7.36046	.00011	-.00148
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.80000	9.06000	-5.27380	-5.27381	.00001	-.00017
-2.80000	9.06000	-5.27380	-5.27381	.00001	-.00011
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.80000	2.66000	[illegible]	[illegible]	-.00002	.00034
2.30000	9.76000	[illegible]	[illegible]	.00330	-.06792
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.80000	1.76000	[illegible]	-7.70140	.00164	-.02129
-2.80000	1.76000	[illegible]	[illegible]	.00244	-.03174
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-3.30000	9.86000	[illegible]	[illegible]	.00007	-.00133
3.30000	2.16000	[illegible]	-7.74748	[illegible]	-.00277
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.30000	10.36000	-4.63327	-4.63313	-.00014	.00309
-1.80000	10.36000	-4.63327	-4.63263	-.00064	.01372
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-1.80000	1.36000	[illegible]	[illegible]	.00092	-.01160
.80000	10.66000	[illegible]	-4.32108	.00273	-.06046
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.80000	1.06000	-8.00731	-8.00774	[illegible]	[illegible]
-.80000	1.36000	-8.00731	[illegible]	.00075	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-.30000	10.36000	[illegible]	[illegible]	[illegible]	[illegible]
.30000	1.36000	[illegible]	[illegible]	[illegible]	.01436
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Distribution C300.

r	Z	TRUE [illegible]	SPLINE [illegible]	TRU-SPL	PERC ERR(%)
4.50000	6.36000	-6.17973	-6.17962	-.00011	.00176
-4.50000	6.36000	-6.17973	-6.17961	-.00012	.00187
4.50000	5.36000	-6.54316	-6.54301	-.00015	.00234
-4.50000	5.36000	-6.54316	-6.54317	.00001	-.00010
4.60000	7.36000	-5.72605	-5.72621	.00016	-.00281
-4.60000	7.36000	-5.72605	-5.72760	.00155	-.02712
4.60000	4.36000	-6.81635	-6.81823	.00188	-.02758
-4.60000	4.36000	-6.81635	-6.81738	.00103	-.02240
3.30000	7.36000	-5.69845	-5.69855	.00010	-.00167
-3.30000	7.36000	-5.69845	-5.69856	.00011	-.00200
3.30000	3.86000	-7.15219	-7.15229	.00010	.00136
-3.30000	3.86000	-7.15219	-7.15227	.00008	-.00112
3.80000	8.86000	-5.17997	-5.17985	-.00012	.00227
-3.80000	8.86000	-5.17997	-5.17985	-.00012	.00238
3.80000	2.86000	-7.36057	-7.36065	.00008	-.00112
-3.80000	2.86000	-7.36057	-7.36066	.00009	-.00127
2.30000	9.06000	-5.27350	-5.27350	.00000	-.00006
-2.30000	9.06000	-5.27350	-5.27350	.00000	-.00001
2.30000	2.66000	-7.59947	-7.59945	-.00002	.00022
-2.30000	2.66000	-7.59947	-7.59945	-.00002	.00023
2.30000	9.76000	-4.86498	-4.86778	.00300	-.06170
-2.30000	9.76000	-4.86498	-4.86778	.00300	-.06177
2.30000	1.96000	-7.69976	-7.70123	.00147	-.01910
-2.30000	1.96000	-7.69976	-7.70194	.00218	-.02834
2.20000	7.56000	-5.07783	-5.07784	.00001	-.00011
-2.20000	7.56000	-5.07783	-5.07783	.00000	-.00008
2.20000	2.16000	-7.76723	-7.76733	.00010	-.00133
-2.20000	2.16000	-7.76723	-7.76725	.00002	-.00026
1.30000	10.36000	-4.63327	-4.63310	-.00017	.00366
-1.30000	10.36000	-4.63327	-4.63264	-.00063	.01360
1.30000	1.36000	-7.90417	-7.90478	.00061	-.00777
-1.80000	1.36000	-7.90417	-7.90499	.00082	-.01043
.80000	10.66000	-4.51835	-4.52090	.00255	-.05637
-.80000	10.66000	-4.51835	-4.52071	.00236	-.05570
.80000	1.06000	-8.00731	-8.00772	.00041	-.00506
-.80000	1.06000	-8.00731	-8.00799	.00068	-.00848
.50000	10.36000	-4.72599	-4.72583	-.00016	.00340
-.50000	10.36000	-4.72599	-4.72589	-.00010	.00203
.50000	1.36000	-7.99689	-7.99622	-.00067	.00834
-.50000	1.36000	-7.99689	-7.99613	-.00073	.00910

APPENDIX C

SMOOTH REFLECTOR

Appendix C1. Pattern output data.

ORIGINAL PAGE IS
OF POOR QUALITY

Distribution A200.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-62.77953	-59.41[illegible]	-38.76720	-35.399[illegible]	-57.[illegible]689
-11.750	-53.89823	-61.73181	-29.80589	-37.71948	-53.23646
-11.500	-49.77855	-64.31682	-25.6621	-40.30448	-49.62872
-11.250	-49.06527	-62.17676	-25.05294	-38.[illegible]443	-48.85844
-11.000	-50.81140	-58.37220	-26.79906	-34.35986	-50.11000
-10.750	-52.28814	-55.86776	-28.27580	-31.85542	-50.70912
-10.500	-47.30561	-54.66781	-23.29328	-30.65548	-46.[illegible]400
-10.250	-42.48007	-54.67847	-18.46773	-30.66616	-42.22617
-10.000	-39.31253	-56.05293	-15.30020	-32.04060	-39.[illegible]179
-9.750	-37.37091	-59.42463	-13.37858	-35.41730	-37.36415
-9.500	-36.48356	-66.01056	-12.47123	-41.99823	-36.47902
-9.250	-36.53404	-62.72655	-12.52171	-38.71432	-36.52391
-9.000	-37.64366	-56.84681	-13.63133	-32.83447	-37.59709
-8.750	-40.15274	-53.86876	-16.14041	-29.85643	-39.97227
-8.500	-44.84943	-52.65313	-20.83709	-28.64080	-44.10342
-8.250	-49.14007	-52.90853	-25.12774	-28.89630	-47.61780
-8.000	-43.88617	-54.85784	-19.87384	-30.84550	-43.55242
-7.750	-40.30822	-59.27887	-16.29589	-35.26653	-40.25382
-7.500	-38.97469	-61.21808	-14.96235	-37.20573	-38.[illegible]
-7.250	-39.52289	-54.84677	-15.51055	-30.83444	-39.39755
-7.000	-42.40484	-50.80839	-18.39251	-26.79606	-41.01926
-6.750	-47.96021	-48.70744	-23.94788	-24.69511	-45.[illegible]777
-6.500	-42.76315	-48.06629	-18.75081	-24.05396	-41.641[illegible]
-6.250	-36.99232	-48.90697	-12.97999	-24.89463	-36.2178
-6.000	-33.80688	-51.84080	-9.[illegible]	-27.82826	-3[illegible]941
-5.750	-32.26787	-58.41322	-8.25553	-34.40088	-32.[illegible]
-5.500	-32.12867	-54.38376	-8.11634	-30.371[illegible]	-32.10[illegible]
-5.250	-33.61652	-47.80770	-9.60419	-23.79536	-[illegible]444
-5.000	-37.87766	-44.29850	-13.86532	-20.28617	-36.[illegible]600
-4.750	-47.11866	-42.57640	-23.10633	-18.56407	-41.[illegible]93
-4.500	-36.56269	-42.35854	-12.55035	-18.3[illegible]0	-3[illegible]
-4.250	-31.16422	-44.06709	-7.15180	-20.05476	-30.94744
-4.000	-28.65761	-49.66507	-4.64528	-25.65273	-28.[illegible]360
-3.750	-28.27002	-50.11042	-4.25769	-26.09809	-28.24[illegible]
-3.500	-30.71329	-40.19244	-6.70096	-16.18011	-30.24964
-3.250	-40.29598	-34.74189	-16.28364	-10.72956	-33.[illegible]569
-3.000	-27.84980	-31.08873	-3.83747	-7.07640	-26.164[illegible]
-2.750	-19.91655	-28.45938	4.09579	-4.44705	-19.34830
-2.500	-14.87049	-26.54757	9.14184	-2.53523	-14.5[illegible]1
-2.250	-11.15568	-25.20841	12.85665	-1.19609	-10.90844
-2.000	-8.26250	-24.37171	15.74984	-.35938	-8.15769
-1.750	-5.95888	-24.01233	18.05346	0.00000	-5.8[illegible]171
-1.500	-4.11899	-24.14230	19.89334	-.12996	-4.[illegible]631
-1.250	-2.66730	-24.81740	21.34503	-.80506	-2.64120
-1.000	-1.55568	-26.16513	22.45666	-2.15280	-1.54097
-.750	-.75571	-28.46923	23.25962	-4.45693	-.74567
-.500	-.23817	-32.48580	23.77416	-8.47347	-.23738
-.250	0.00000	-41.68340	24.01233	-17.67106	0.00000
0.000	-.03275	-44.92642	23.97958	-1[illegible]1409	-.03[illegible]

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1674911E+00)= 12.3974075

20LOG(MAX(FIELD-Y))=20LOG(2.6252778E-01)= -11.6130404

ORIGINAL PAGE IS OF POOR QUALITY

A200. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	0.00000	-41.89367	24.13655	-17.75712	0.00000
.250	-.30414	-32.56176	23.83242	-8.42571	-.30184
.500	-.88604	-28.53383	23.25051	-4.39727	-.87887
.750	-1.75869	-26.23692	22.37787	-2.10037	-1.74351
1.000	-2.94315	-24.90328	21.19340	-.76672	-2.91587
1.250	-4.47148	-24.24604	19.66507	-.10949	-4.43426
1.500	-6.39174	-24.13555	17.74481	0.00000	-6.[illegible]
1.750	-8.77760	-24.51835	15.35895	-.38180	-8.66360
2.000	-11.74730	-25.37864	12.38925	-1.24208	-11.5[illegible]
2.250	-15.50573	-26.74100	8.63082	-2.60445	-15.19094
2.500	-20.44686	-28.67202	3.68970	-4.53547	-19.83834
2.750	-27.35020	-31.30700	-3.21364	-7.17045	-25.88273
3.000	-34.31756	-34.72261	-10.18100	-10.73606	-31.57954
3.250	-32.01723	-40.16714	-7.88068	-16.03059	-31.39830
3.500	-31.01098	-48.74719	-6.87443	-24.61063	-30.73873
3.750	-32.78718	-50.50498	-8.65053	-26.36843	-32.[illegible]
4.000	-37.98016	-45.49806	-13.84361	-21.36150	-37.27732
4.250	-43.54881	-44.04863	-19.41226	-19.91208	-40.78152
4.500	-35.82037	-44.67998	-11.68382	-20.54342	-35.[illegible]
4.750	-31.97748	-47.18720	-7.84093	-23.05065	-31.84884
5.000	-30.43684	-52.40650	-6.30029	-28.26995	-30.40962
5.250	-30.38697	-59.77783	-6.25042	-35.64128	-30.[illegible]
5.500	-31.65419	-52.93236	-7.51763	-28.79581	-31.62223
5.750	-34.45826	-48.93493	-10.32171	-24.79838	-34.30632
6.000	-39.59319	-47.41566	-15.45664	-23.27911	-38.79984
6.250	-44.98323	-47.47435	-20.84668	-23.33780	-43.04255
6.500	-39.73768	-48.94445	-15.60113	-24.80789	-39.24543
6.750	-36.24361	-52.12543	-12.10705	-27.98888	-36.[illegible]
7.000	-34.93183	-57.82724	-10.79527	-33.69068	-34.90787
7.250	-35.16467	-59.76796	-11.02812	-35.63141	-35.14[illegible]
7.500	-36.89074	-54.45791	-12.75419	-30.32135	-36.81564
7.750	-40.68670	-51.64119	-16.55014	-27.50464	-40.35166
8.000	-49.55711	-50.70131	-25.42056	-26.56475	-47.08162
8.250	-50.39973	-51.21826	-26.26318	-27.08170	-47.77972
8.500	-42.18808	-53.28025	-18.05153	-29.14367	-41.86312
8.750	-39.26865	-57.73259	-15.13210	-33.59604	-39.20751
9.000	-38.51737	-68.67800	-14.38082	-44.54144	-38.[illegible]347
9.250	-39.42004	-61.97730	-15.28349	-37.84075	-39.39[illegible]
9.500	-42.29232	-55.96300	-18.15577	-31.82645	-42.10998
9.750	-49.31584	-53.49034	-25.17929	-29.35379	-47.90970
10.000	-56.44110	-52.79395	-32.30455	-28.6739	-51.[illegible]540
10.250	-44.42604	-53.49755	-20.28949	-29.36099	-43.91929
10.500	-40.32345	-55.76222	-16.18689	-31.62566	-40.20133
10.750	-38.53876	-60.63577	-14.40221	-36.49922	-38.51233
11.000	-38.17334	-75.66481	-14.03679	-51.52826	-38.17285
11.250	-39.03396	-63.59258	-14.89741	-39.45603	-39.01907
11.500	-41.28906	-57.78431	-17.15251	-33.64775	-41.19308
11.750	-45.67014	-55.40401	-21.53358	-31.26746	-45.[illegible]
12.000	-53.40074	-54.74012	-29.26419	-30.60357	-51.00398

MAXIMUM FIELD VALUES:

20LOG(MAX(FIELD-Z))=20LOG(4.1518075E+00)= 12.3647443

20LOG(MAX(FIELD-Y))=20LOG(2.5787519E-01)= -11.7718086

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 78.000 TO 90.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
78.000	-43.54314	-77.57574	-1.72622	-35.75882	-43.54170
78.250	-46.06702	-76.52807	-4.25011	-34.71116	-46.06340
78.500	-49.40675	-75.76231	-7.58984	-33.94540	-49.39499
78.750	-49.36881	-75.35284	-7.55187	-33.53593	-49.35815
79.000	-46.08843	-75.37346	-4.27152	-33.55654	-46.08360
79.250	-43.66438	-75.92092	-1.84747	-34.10400	-43.66208
79.500	-42.45526	-77.15497	-.63835	-35.33805	-42.45407
79.750	-42.21321	-79.39554	-.39630	-37.57863	-42.21266
80.000	-42.63470	-83.46126	-.81779	-41.64435	-42.63462
80.250	-43.17404	-92.34061	-1.35713	-50.52370	-43.17427
80.500	-43.06126	-88.87183	-1.24434	-47.05491	-43.06143
80.750	-42.15873	-81.60481	-.34181	-39.78789	-42.15851
81.000	-41.15977	-77.88122	.65714	-35.06431	-41.15713
81.250	-40.65159	-75.62311	1.16533	-33.80620	-40.65049
81.500	-40.87869	-74.17862	.93823	-32.36170	-40.87694
81.750	-41.87070	-73.22646	-.05378	-31.40954	-41.86780
82.000	-43.27192	-72.54882	-1.45500	-30.73191	-43.26707
82.250	-43.82438	-71.98462	-2.00746	-30.16770	-43.81803
82.500	-42.65061	-71.44602	-.83367	-29.82911	[illegible]
82.750	-41.03181	-70.93694	.78510	-29.12002	-41.02766
83.000	-40.05117	-70.52917	1.76575	-28.71225	-40.04756
83.250	-40.00057	-70.30405	1.81635	-28.48713	-39.99980
83.500	-40.90227	-70.28481	.91465	-28.46790	-40.89755
83.750	-42.50579	-70.34344	-.68888	-28.52652	-42.49893
84.000	-43.82830	-70.07824	-2.01139	-28.26132	-43.81830
84.250	-43.97280	-68.93821	-2.15589	-27.12129	-43.95926
84.500	-44.42309	-66.85474	-2.60618	-25.03783	-44.39864
84.750	-48.24462	-64.32530	-6.42770	-22.50839	-48.13717
85.000	-50.53803	-61.77956	-8.72112	-19.96264	-50.22368
85.250	-38.40188	-59.38890	3.41504	-17.57199	-38.36769
85.500	-31.81861	-57.18833	9.99831	-15.37141	-31.80029
85.750	-27.32896	-55.16970	14.48796	-13.35278	-27.32210
86.000	-23.98504	-53.31843	17.83188	-11.50151	-23.98026
86.250	-21.38478	-51.62394	20.43213	-9.80702	-21.38095
86.500	-19.28121	-50.08051	22.53570	-8.26360	-19.27788
86.750	-17.46872	-48.6857	24.34819	-6.86846	-7.46572
87.000	-15.75224	-47.43661	26.06468	-5.61969	-15.74957
87.250	-13.97460	-46.33166	27.84231	-4.51475	-13.97236
87.500	-12.07345	-45.36659	29.74346	-3.54968	-12.07170
87.750	-10.09656	-44.53581	31.72036	-2.71890	-10.09528
88.000	-8.14847	-43.83222	33.66845	-2.01530	-8.14757
88.250	-6.32728	-43.24759	35.48964	-1.43067	-6.32668
88.500	-4.69833	-42.77321	37.11859	-.95629	-4.69793
88.750	-3.29674	-42.40062	38.52017	-.58371	-3.29649
89.000	-2.13825	-42.12253	39.67866	-.30561	-2.13810
89.250	-1.22842	-41.93367	40.58850	-.11675	-1.22833
89.500	-.56845	-41.83156	41.24846	-.01464	-.56841
89.750	-.15860	-41.81692	41.65832	0.00000	-.15858
90.000	0.00000	-41.89367	41.81692	-.07676	0.00000

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1518075E+00)= 12.3647443

20LOG(MAX(FIELD-Y))=20LOG(3.3681501E-02)= -29.4521714

ORIGINAL PAGE IS
OF POOR QUALITY

A200. Concluded.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 90.000 TO 102.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
90.000	0.00000	-41.89367	41.89367	0.00000	0.00000
90.250	-.09572	-42.06865	41.79795	-.17498	-.09573
90.500	-.45138	-42.35092	41.44229	.45724	-45138
90.750	-1.07541	-42.75111	40.81826	-.8574	-1.07540
91.000	-1.97980	-43.28075	39.91487	-1.38707	-1.97876
91.20	-3.17366	-43.95173	38.72001	-2.05811	-3.17358
91.500	-4.66870	-44.77627	37.22497	-2.88259	-4.66856
91.750	-6.45702	-45.76629	35.43665	-3.87261	-6.45680
92.000	-8.48662	-46.93400	33.40706	-5.04032	-8.48628
92.250	-10.6[illegible]	-48.29185	31.29002	-6.39817	-10.[illegible]20
92.500	-12.50[illegible]74	-49.85297	29.38793	-7.95930	-12.50522
92.750	-13.8[illegible]	-51.63187	28.01809	-9.73819	-13.87514
93.000	-14.72225	-53.54563	27.17143	-11.75198	-14.7[illegible]7
93.250	-15.40479	-55.91650	26.48889	-14.02287	-15.40468
93.500	-16.30030	-58.47620	25.59337	-16.58253	-16.30032
93.750	-17.66005	-61.37437	24.23362	-19.48070	-17.[illegible]15
94.000	-19.67197	-64.69017	22.22171	-22.79650	-19.67[illegible]1
94.250	-22.56990	-68.52978	19.32378	-26.63610	-22.57007
94.500	-26.81329	-72.85205	15.08038	-30.95838	-26.81347
94.750	-33.72510	-76.32993	8.16858	-34.43625	-33.72514
95.000	-47.38950	-76.28281	-5.49583	-34.38913	-47.38418
95.250	-37.79577	-74.60721	4.09790	-32.71353	-37.79515
95.500	-34.67358	-73.31028	7.22009	-31.41661	-34.67327
95.750	-34.71855	-72.59694	7.17513	-30.70327	-34.71812
96.000	-36.53829	-72.34310	5.35538	-30.44943	-36.53743
96.750	-37.73218	-72.41649	4.11150	-30.52281	-37.78096
96.500	-35.44160	-72.70496	6.45208	-30.81128	-35.44106
96.750	-32.54100	-73.12315	9.35267	-31.22947	-32.54091
97.000	-30.70676	-73.62714	11.18691	-31.73346	-30.70682
97.250	-29.93961	-74.22456	11.95407	-32.33089	-29.93973
97.500	-30.13576	-74.96496	11.75792	-33.07128	-30.13589
97.750	-31.30024	-75.91076	10.59344	-34.01709	-31.30037
98.000	-33.60835	-77.09564	8.28512	-35.20197	-33.60864
98.250	-37.61250	-78.45817	4.28117	-36.56450	-37.61[illegible]43
98.500	-45.34086	-79.73002	-3.44718	-37.83635	-45.33956
98.750	-51.77595	-80.40383	-9.88227	-38.51016	-51.77028
99.000	-42.78624	-80.15638	-.89256	-38.26270	-42.78577
99.250	-40.00626	-79.28272	1.88741	-37.38905	-40.00603
99.500	-39.74677	-78.26027	2.14690	-36.36659	-39.74644
99.750	-41.50263	-77.33189	.39104	-35.43822	-41.50178
100.000	-46.01442	-76.54668	-4.12074	-34.65300	-46.01086
100.250	-53.55170	-75.87943	-11.65803	-33.98576	-53.52665
100.500	-46.07132	-75.29723	-4.17765	-33.40355	-46.06642
100.750	-41.32206	-74.78555	.57162	-32.89187	-41.32038
101.000	-39.15272	-74.35095	2.74095	-32.45727	-39.15169
101.250	-38.53492	-74.01206	3.35875	-32.11838	-38.53397
101.500	-39.19950	-73.78921	2.69417	-31.89554	-39.19828
101.750	-41.23027	-73.67844	.66341	-31.80477	-41.2[illegible]809
102.000	-44.94982	-73.75036	-3.05614	-31.85668	-44.94433

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1518075E+00)= 12.3647443

20LOG(MAX(FIELD-Y))=20LOG(3.3385160E-02)= -29.5289307

ORIGINAL PAGE IS
OF POOR QUALITY

Distribution B200.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-51.93583	-61.56091	-27.87022	-37.49530	-51.48681
-11.750	-54.52623	-62.62150	-30.46062	-38.55589	-53.70058
-11.500	-51.53059	-63.80269	-27.46497	-39.73708	-51.78090
-11.250	-50.15234	-62.18421	-26.08673	-38.11859	-49.88886
-11.000	-51.63166	-58.98435	-27.56605	-34.91873	-50.89864
-10.750	-57.86057	-56.50635	-33.79496	-32.44074	-54.12095
-10.500	-53.88796	-55.11478	-29.82235	-31.04917	-51.44825
-10.250	-45.97538	-54.80324	-21.90976	-30.73762	-45.44117
-10.000	-41.65358	-55.66524	-17.58797	-31.59963	-41.48484
-9.750	-39.09973	-58.05112	-15.03412	-33.78550	-39.04515
-9.500	-37.74425	-62.65575	-13.67864	-38.59014	-37.73061
-9.250	-37.40038	-64.63925	-13.33477	-40.57364	-37.39254
-9.000	-38.06523	-59.08951	-13.99962	-35.02389	-38.03142
-8.750	-39.87012	-55.55857	-15.80450	-31.49296	-39.75482
-8.500	-42.86812	-53.93850	-18.80251	-29.87288	-42.54166
-8.250	-44.99060	-53.84817	-20.92499	-29.78257	-44.45983
-8.000	-42.63166	-55.39218	-18.56605	-31.32657	-42.40790
-7.750	-39.84098	-59.10038	-15.77537	-35.03477	-39.79014
-7.500	-38.45577	-61.55126	-14.39016	-37.48567	-38.43489
-7.250	-38.58357	-55.94537	-14.51796	-31.87976	-38.50493
-7.000	-40.56931	-51.75836	-16.50370	-27.69275	-40.25135
-6.750	-45.94273	-49.47278	-21.87712	-25.40717	-44.34861
-6.500	-50.74797	-48.63253	-26.68236	-24.56692	-46.55276
-6.250	-41.20123	-49.20016	-17.13562	-25.13455	-40.56252
-6.000	-36.71719	-51.57515	-12.65157	-27.50754	-36.57791
-5.750	-34.61335	-56.40089	-10.54774	-32.33528	-34.58503
-5.500	-34.18650	-54.86353	-10.12089	-30.79792	-34.14985
-5.250	-35.51898	-48.80401	-11.45336	-24.73840	-35.32014
-5.000	-39.42165	-45.24483	-15.35604	-21.17921	-38.41270
-4.750	-42.82067	-43.47374	-18.75505	-19.40813	-40.12500
-4.500	-35.85870	-43.26416	-11.79309	-19.19855	-35.13383
-4.250	-31.32257	-45.06779	-7.25696	-21.00217	-31.14335
-4.000	-29.13700	-51.20838	-5.07139	-27.14277	-29.11049
-3.750	-28.97739	-49.76053	-4.91178	-25.69492	-28.94133
-3.500	-31.85150	-40.17486	-7.78589	-16.10925	-31.25578
-3.250	-42.39586	-34.83802	-18.33025	-10.77241	-34.13624
-3.000	-27.39328	-31.21715	-3.32767	-7.15154	-25.88735
-2.750	-19.79675	-28.59077	4.26887	-4.52516	-19.25861
-2.500	-14.86355	-26.66847	9.20206	-2.60286	-14.58636
-2.250	-11.19538	-25.31143	12.87023	-1.24582	-11.03058
-2.000	-8.32111	-24.45193	15.74450	-.38631	-8.21688
-1.750	-6.02237	-24.06561	18.04324	0.00000	-5.95511
-1.500	-4.17944	-24.16414	19.88618	-.09853	-4.13643
-1.250	-2.71988	-24.80155	21.34573	-.73594	-2.67343
-1.000	-1.59737	-26.10085	22.46825	-2.03523	-1.58235
-.750	-.78156	-28.33376	23.28405	-4.26815	-.77430
-.500	-.25295	-32.21280	23.81266	-8.14718	-.25055
-.250	0,00000	-40.85153	24.06561	-16.78592	0.00000
0.000	-.01767	-42.90755	24.04794	-18.84193	-.01780

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1456127E+00)= 12.3517746

20LOG(MAX(FIELD-Y))=20LOG(2.5960204E-01)= -11.7130380

B200. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	0.00000	-42.88988	24.07964	-18.81023	0.00000
.250	-.28915	-32.85890	23.79050	-8.77925	-.28697
.500	-.85658	-28.68123	23.22306	-4.60159	-.84764
.750	-1.71583	-26.30877	22.36381	-2.22913	-1.70099
1.000	-2.88879	-24.92356	21.19085	-.84392	-2.86192
1.250	-4.40883	-24.22518	19.67081	-.14553	-4.36378
1.500	-6.32633	-24.07964	17.75331	0.00000	-6.25431
1.750	-8.71930	-24.42782	15.36034	-.34818	-8.60440
2.000	-11.71500	-25.25520	12.36464	-1.17556	-11.52715
2.250	-15.53920	-26.58393	8.54044	-2.50428	-15.27074
2.500	-20.64094	-28.47385	3.43871	-4.39921	-19.97970
2.750	-27.90528	-31.07255	-3.82564	-6.99290	-26.19629
3.000	-33.53025	-34.63610	-9.45060	-10.55646	-31.03799
3.250	-30.30443	-39.80475	-6.22478	-15.72510	-29.84784
3.500	-29.30477	-48.32491	-5.22513	-24.24527	-29.25091
3.750	-30.75429	-50.72553	-6.67464	-26.64589	-30.71101
4.000	-34.80678	-45.43075	-10.72714	-21.35111	-34.44624
4.250	-41.15970	-43.86806	-17.08006	-19.78842	-39.29602
4.500	-36.76770	-44.43389	-12.68805	-20.35425	-36.08179
4.750	-32.48949	-46.89423	-8.40985	-22.81459	-32.37499
5.000	-30.67746	-52.08566	-6.59782	-28.00602	-30.64639
5.250	-30.48054	-59.37533	-6.40090	-35.29568	-30.47516
5.500	-31.68960	-52.40881	-7.60996	-28.32916	-31.65318
5.750	-34.57540	-48.35937	-10.49576	-24.27973	-34.39761
6.000	-40.38526	-46.76750	-16.30562	-22.68786	-39.48634
6.250	-47.86884	-46.72375	-23.78920	-22.64911	-44.25142
6.500	-39.46225	-48.06471	-15.38261	-23.98507	-38.90120
6.750	-35.51990	-51.06733	-11.44026	-26.98769	-35.40071
7.000	-33.99225	-56.92560	-9.91261	-32.84596	-33.97042
7.250	-33.98687	-62.70170	-9.90723	-38.62206	-33.98126
7.500	-35.34387	-55.43305	-11.26423	-31.35340	-35.30175
7.750	-38.37028	-51.84183	-14.29064	-27.76218	-38.17950
8.000	-44.33057	-50.51971	-20.25092	-26.44007	-43.39438
8.250	-50.94141	-50.73320	-25.86177	-26.65356	-47.82598
8.500	-43.14538	-52.42070	-19.06574	-28.34106	-42.66057
8.750	-39.54815	-56.09671	-15.46851	-32.01707	-39.45728
9.000	-38.36884	-63.37718	-14.28920	-39.29754	-38.35538
9.250	-38.87732	-62.33216	-14.79768	-38.25252	-38.85799
9.500	-41.16028	-56.27526	-17.08064	-32.19561	-41.02877
9.750	-46.19493	-53.53414	-22.11528	-29.45449	-45.45967
10.000	-51.39423	-52.62281	-27.31458	-28.54317	-48.95514
10.250	-44.15307	-53.11099	-20.07343	-29.03135	-43.63360
10.500	-39.96131	-55.07932	-15.88167	-30.99967	-39.82990
10.750	-37.94161	-59.28778	-13.86197	-35.20813	-37.91010
11.000	-37.29330	-69.06541	-13.21365	-44.98577	-37.29063
11.250	-37.77536	-64.44943	-13.69572	-40.36978	-37.76625
11.500	-39.42181	-58.14530	-15.34216	-34.06566	-39.36415
11.750	-42.52812	-55.51062	-18.44848	-31.43098	-42.31512
12.000	-47.40569	-54.68661	-23.32605	-30.60697	-46.66130

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1371878E+00)= 12.3341046

20LOG(MAX(FIELD-Y))=20LOG(2.5865632E-01)= -11.7455381

ORIGINAL PAGE IS
OF POOR QUALITY

B200. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 78.000 TO 90.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
78.000	-54.62465	-71.87505	-12.14979	-29.40018	-54.54384
78.250	-61.71247	-71.08030	-19.23761	-28.60543	-61.23734
78.500	-49.64106	-70.80079	-7.16620	-28.32592	-49.60816
78.750	-45.00966	-70.90729	-2.53479	-28.43242	-44.99872
79.000	-42.65790	-71.26483	-.18304	-28.78996	-42.65215
79.250	-41.61426	-71.70085	.86061	-29.22599	-41.61022
79.500	-41.52884	-72.00855	.74503	-29.53369	-41.52517
79.750	-42.15238	-72.01711	.32248	-29.54224	-42.14813
80.000	-43.01762	-71.68793	-.54275	-29.21306	-43.01194
80.250	-43.25473	-71.11462	-.77987	-28.63976	-43.24705
80.500	-42.44488	-70.42503	.02998	-27.95016	-42.43820
80.750	-41.31654	-69.70626	1.15833	-27.23140	-41.31047
81.000	-40.62044	-68.99389	1.35442	-26.51902	-40.61436
81.250	-40.66377	-68.29055	1.81090	-25.81569	-40.65669
81.500	-41.49679	-67.58790	.97308	-25.11303	-41.48634
81.750	-42.79693	-66.88519	-.32207	-24.41032	-42.78025
82.000	-43.30654	-66.20236	-.83168	-23.72749	-43.28453
82.250	-41.97705	-65.58461	.49781	-23.10974	-41.95839
82.500	-40.07544	-65.09866	2.39942	-22.62379	-40.06203
82.750	-38.76263	-64.82616	3.71223	-22.35130	-38.75212
83.000	-38.34353	-64.86216	4.13133	-22.38729	-38.33408
83.250	-38.85955	-65.32500	3.61532	-22.85014	-38.84998
83.500	-40.19226	-66.38829	2.28260	-23.91342	-40.18207
83.750	-41.62438	-68.36782	.85049	-25.89295	-41.61542
84.000	-41.67058	-72.50176	.80419	-29.52689	-41.66688
84.250	-40.65883	-79.06373	1.81604	-36.58886	-40.65043
84.500	-40.48106	-75.74163	1.99380	-33.26677	-40.47999
84.750	-42.72832	-68.64696	-.25345	-26.17210	-42.71744
85.000	-48.27235	-64.30949	-5.79748	-21.83462	-48.16573
85.250	-39.13216	-61.16748	3.34271	-18.69261	-39.10529
85.500	-31.97097	-58.61668	10.50389	-16.14182	-31.96180
85.750	-27.29744	-56.37884	15.17742	-13.90398	-27.29230
86.000	-23.91166	-54.32334	18.56320	-11.84847	-23.90794
86.250	-21.32093	-52.40429	21.15394	-9.92942	-21.31777
86.500	-19.23762	-50.62204	23.23724	-8.14718	-19.23469
86.750	-17.43111	-48.99486	25.04376	-6.51999	-17.42830
87.000	-15.69229	-47.54191	26.78258	-5.06705	-15.68967
87.250	-13.86780	-46.27628	28.60706	-3.80141	-13.86553
87.500	-11.91623	-45.20370	30.55863	-2.72883	-11.91442
87.750	-9.90607	-44.32363	32.56879	-1.84377	-9.90472
88.000	-7.94861	-43.63054	34.52626	-1.15568	-7.94766
88.250	-6.13758	-43.11472	36.33728	-.63986	-6.13694
88.500	-4.53097	-42.76255	37.94390	-.28769	-4.53054
88.750	-3.15782	-42.55646	39.31705	-.08159	-3.15754
89.000	-2.02987	-42.47487	40.44500	0.00000	-2.02970
89.250	-1.15029	-42.49276	41.32458	-.01789	-1.15019
89.500	-.51893	-42.58347	41.95593	-.10860	-.51889
89.750	-.13527	-42.72205	42.33959	-.24719	-.13526
90.000	0.00000	-42.88983	42.47487	-.41501	0.00000

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1371370E+00)= 12.3341046

20LOG(MAX(FIELD-Y))=20LOG(3.1114438E-02)= -30.1407608

ORIGINAL PAGE IS
OF POOR QUALITY

B200. Concluded.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 90.000 TO 102.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
90.000	0.00000	-42.88988	42.88988	0.00000	0.00000
90.250	-.11589	-43.07384	42.77398	-.18897	-.11590
90.500	-.48834	-43.29334	42.40154	-.40347	-.48833
90.750	-1.12548	-43.54885	41.76439	-.65897	-1.12546
91.000	-2.03795	-43.86784	40.85192	-.97796	-2.03789
91.250	-3.23725	-44.27508	39.65263	-1.38520	-3.23713
91.500	-4.73108	-44.79386	38.15879	-1.90399	-4.73088
91.750	-6.51097	-45.44396	36.37890	-2.55408	-6.51064
92.000	-8.52278	-46.24098	34.36710	-3.35110	-8.52227
92.250	-10.61143	-47.19676	32.27845	-4.30689	-10.61070
92.500	-12.47890	-48.32030	30.41097	-5.43042	-12.47799
92.750	-13.81971	-49.61707	29.07016	-6.72719	-13.81879
93.000	-14.64795	-51.10090	28.24193	-8.21102	-14.64719
93.250	-15.31304	-52.77649	27.57683	-9.88661	-15.31249
93.500	-16.18101	-54.66286	26.70887	-11.77298	-16.18062
93.750	-17.49570	-56.78778	25.37417	-13.89791	-17.49541
94.000	-19.43604	-59.17439	23.45384	-16.30452	-19.43580
94.250	-22.21443	-61.94154	20.67544	-19.05166	-22.21420
94.500	-26.21672	-65.07719	16.67316	-22.18731	-26.21638
94.750	-32.33304	-68.47479	10.55683	-25.58492	-32.33221
95.000	-40.40607	-71.23753	2.48380	-28.34765	-40.40271
95.250	-36.65961	-71.75503	6.23026	-28.86515	-36.65849
95.500	-33.94971	-70.61126	8.94017	-27.72139	-33.94900
95.750	-33.94003	-69.32199	8.94985	-26.43212	-33.93899
96.000	-35.95598	-68.33671	6.93390	-25.44684	-35.95369
96.250	-39.09496	-67.65922	3.79491	-24.76935	-39.08915
96.500	-38.17869	-67.23438	4.71119	-24.34451	-38.17352
96.750	-34.47690	-67.02937	8.41298	-24.13950	-34.47471
97.000	-31.97668	-67.03789	10.91320	-24.14801	-31.97554
97.250	-30.76121	-67.26698	12.12867	-24.37710	-30.76046
97.500	-30.60431	-67.72111	12.28557	-24.83123	-30.60368
97.750	-31.43076	-68.38689	11.45911	-25.49701	-31.43011
98.000	-33.33757	-69.21889	9.55230	-26.32902	-33.33668
98.250	-36.71618	-70.13223	6.17370	-27.24235	-36.71442
98.500	-42.92633	-71.01957	-.03646	-28.12969	-42.91982
98.750	-59.25083	-71.80827	-16.36095	-28.91839	-59.01649
99.000	-45.18580	-72.52515	-2.29593	-29.63528	-45.17802
99.250	-40.99636	-73.29806	1.89352	-30.40818	-40.99402
99.500	-39.92704	-74.29231	2.96283	-31.40244	-39.92567
99.750	-40.78375	-75.64631	2.10613	-32.75643	-40.78255
100.000	-43.62269	-77.41902	-.73282	-34.52915	-43.62111
100.250	-49.03373	-79.48425	-6.14385	-36.59437	-49.03004
100.500	-49.37866	-81.35086	-6.48879	-38.46098	-49.37613
100.750	-44.0717	-82.41206	-1.18192	-39.52218	-44.07138
101.000	-41.23375	-82.93020	1.65612	-40.04032	-41.23368
101.250	-40.19012	-83.84436	2.69975	-40.95449	-40.19016
101.500	-40.57447	-85.78548	2.31541	-42.39561	-40.57456
101.750	-42.49901	-87.47007	.39086	-44.58020	-42.49910
102.000	-46.87494	-84.52700	-3.98506	-41.63712	-46.87441

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1371878E+00)= 12.3341046

20LOG(MAX(FIELD-Y))=20LOG(2.9662753E-02)= -30.5557708

Distribution C100.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-47.42032	-59.33896	-23.49438	-35.41303	-47.14999
-11.750	-44.28127	-63.21633	-20.35534	-39.29040	-44.22640
-11.500	-43.05549	-74.02573	-19.12956	-50.09980	-43.05229
-11.250	-43.37406	-66.07458	-19.44812	-42.14865	-43.35107
-11.000	-45.52851	-59.52236	-21.60258	-35.59643	-45.35901
-10.750	-51.05323	-56.54684	-27.12729	-32.62091	-49.97376
-10.500	-55.48244	-55.40409	-31.55651	-31.47816	-52.43306
-10.250	-46.13117	-55.77134	-22.20524	-31.84541	-45.68355
-10.000	-41.62203	-57.93634	-17.69610	-34.01041	-41.52200
-9.750	-39.33311	-63.20358	-15.40718	-39.27765	-39.31551
-9.500	-38.48507	-66.30622	-14.55914	-42.38027	-38.47818
-9.250	-38.92857	-58.25871	-15.00264	-34.33278	-38.87847
-9.000	-40.88776	-53.98312	-16.96183	-30.05717	-40.63016
-8.750	-45.02346	-51.82389	-21.09752	-27.89776	-44.19979
-8.500	-48.24339	-51.13032	-24.31746	-27.20439	-46.44123
-8.250	-42.67918	-51.85490	-18.75325	-27.92877	-42.18378
-8.000	-38.63513	-54.52645	-14.70920	-30.60052	-38.52497
-7.750	-36.57538	-61.90119	-12.64944	-37.97525	-36.56293
-7.500	-36.01251	-65.34596	-12.08658	-41.42002	-36.00772
-7.250	-36.94994	-54.15623	-13.02401	-30.23030	-36.86835
-7.000	-40.01879	-49.83089	-16.09285	-25.90496	-39.58771
-6.750	-47.86442	-47.75258	-23.93849	-23.82665	-44.79011
-6.500	-44.86540	-47.19710	-20.93947	-23.27117	-42.36659
-6.250	-37.44220	-48.18743	-13.51626	-24.26150	-37.09125
-6.000	-33.92954	-51.54916	-10.00361	-27.62323	-33.85533
-5.750	-32.37358	-63.05866	-8.44765	-39.13273	-32.37015
-5.500	-32.38919	-55.22738	-8.46326	-31.30145	-32.36673
-5.250	-34.29589	-47.32613	-10.36996	-23.40020	-34.08522
-5.000	-40.04733	-43.62561	-16.12140	-19.69968	-38.46789
-4.750	-48.03369	-41.81977	-24.10776	-17.89384	-40.88872
-4.500	-34.58287	-41.50982	-10.65694	-17.58389	-33.73081
-4.250	-29.65739	-42.97456	-5.73146	-19.04863	-29.45991
-4.000	-27.34708	-47.67174	-3.42115	-23.74581	-27.30724
-3.750	-26.95196	-50.07608	-3.02603	-26.15015	-26.93113
-3.500	-29.06973	-40.36815	-5.14380	-16.44222	-28.75932
-3.250	-38.16138	-34.76244	-14.23545	-10.83651	-33.12753
-3.000	-29.00522	-31.03958	-5.07928	-7.11365	-26.87432
-2.750	-20.26158	-28.37838	3.66435	-4.45245	-19.63873
-2.500	-14.99784	-26.45329	8.92309	-2.52736	-14.69809
-2.250	-11.19746	-25.11113	12.72847	-1.18520	-11.02485
-2.000	-8.26631	-24.27772	15.65962	-.35179	-8.15912
-1.750	-5.94610	-23.92593	17.97983	0.00000	-5.87777
-1.500	-4.10042	-24.06693	19.82551	-.14100	-4.05715
-1.250	-2.64870	-24.75657	21.27723	-.83064	-2.62273
-1.000	-1.54018	-26.12373	22.38575	-2.19780	-1.52536
-.750	-.74192	-28.45683	23.18401	-4.53090	-.73485
-.500	-.23275	-32.53072	23.69318	-8.60479	-.23046
-.250	0.00000	-42.00400	23.92593	-18.07807	0.00000
0.000	-.03781	-41.59585	23.88813	-17.66792	-.03778

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1444456E+00)= 12.3493289

20LOG(MAX(FIELD-Y))=20LOG(2.6373630E-01)= -11.5766020

ORIGINAL PAGE IS
OF POOR QUALITY

C100. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	0.00000	-41.55805	24.10470	-17.45335	0.00000
.250	-.30851	-32.40647	23.79619	-8.30177	-.30613
.500	-.89384	-28.42796	23.21086	-4.32326	-.88649
.750	-1.76875	-26.15779	22.33595	-2.05309	-1.75327
1.000	-2.95414	-24.84295	21.15056	-.73825	-2.92642
1.250	-4.48193	-24.20087	19.62277	-.09617	-4.43614
1.500	-6.40023	-24.10470	17.70447	0.00000	-6.32747
1.750	-8.78323	-24.49901	15.32147	-.39431	-8.66860
2.000	-11.75146	-25.37181	12.35324	-1.26712	-11.56705
2.250	-15.51890	-26.74767	8.58580	-2.64297	-15.20767
2.500	-20.52414	-28.69454	3.58055	-4.58984	-19.90045
2.750	-27.89049	-31.35020	-3.78579	-7.24550	-26.27458
3.000	-38.16678	-34.99599	-14.06208	-10.89129	-33.28822
3.250	-33.38435	-40.28529	-9.27966	-16.18059	-32.57793
3.500	-31.61061	-48.74080	-7.50591	-24.63610	-31.52763
3.750	-33.21045	-49.71623	-9.10575	-25.61153	-33.11473
4.000	-38.85767	-45.13225	-14.75297	-21.02755	-37.73849
4.250	-55.21633	-43.80561	-31.11164	-19.70091	-43.50289
4.500	-37.12699	-44.49735	-13.02230	-20.39295	-36.37670
4.750	-32.64082	-47.08717	-8.53613	-22.98248	-32.48786
5.000	-30.91720	-52.74765	-6.81250	-28.64296	-30.88910
5.250	-30.79825	-70.26125	-6.69356	-46.15655	-30.79807
5.500	-32.07077	-53.96120	-7.96607	-29.85650	-32.04306
5.750	-35.03365	-49.24682	-10.92896	-25.14212	-34.87237
6.000	-41.20513	-47.56058	-17.10044	-23.45588	-40.30127
6.250	-58.13712	-47.57261	-34.03242	-23.46791	-47.20738
6.500	-41.05639	-49.08335	-16.95169	-24.97865	-40.42145
6.750	-36.67091	-52.53932	-12.56621	-28.43462	-36.56070
7.000	-35.10560	-60.29006	-11.00090	-36.18536	-35.09276
7.250	-35.18896	-64.43225	-11.08426	-40.32755	-35.18409
7.500	-36.75413	-54.97651	-12.64943	-30.87181	-37.68952
7.750	-40.18872	-51.57016	-16.08402	-27.46547	-37.88402
8.000	-46.42622	-50.36827	-22.32152	-26.26357	-44.95454
8.250	-46.22881	-50.64301	-22.12411	-26.53831	-44.88768
8.500	-40.80162	-52.34524	-16.69693	-28.24055	-40.50774
8.750	-38.13507	-55.98247	-14.03037	-31.87777	-38.06466
9.000	-37.25119	-63.38649	-13.14649	-39.28179	-37.24093
9.250	-37.77038	-63.62160	-13.66568	-39.51691	-37.75941
9.500	-39.80010	-57.00395	-15.69541	-32.89926	-37.71850
9.750	-44.20472	-54.12648	-20.10002	-30.02179	-43.78393
10.000	-56.28065	-53.18636	-32.17595	-29.08166	-51.45356
10.250	-49.12415	-53.70272	-25.01945	-29.59802	-47.82610
10.500	-42.56580	-55.77869	-18.46110	-31.67399	-42.36364
10.750	-39.88031	-60.36149	-15.77561	-36.25679	-39.84191
11.000	-38.98004	-74.33064	-14.87534	-50.22594	-38.97908
11.250	-39.41015	-64.27795	-15.30545	-40.17325	-39.39632
11.500	-41.21114	-57.97495	-17.10644	-33.87026	-41.12090
11.750	-44.98741	-55.36366	-20.88271	-31.25896	-44.60667
12.000	-53.62083	-54.49481	-29.51614	-30.39012	-51.07588

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1264460E+00)= 12.3115234

20LOG(MAX(FIELD-Y))=20LOG(2.5724164E-01)= -11.7931745

ORIGINAL PAGE IS
OF POOR QUALITY

C100. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 78.000 TO 90.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
78.000	-41.81236	-81.25245	-.57838	-40.01847	-41.81217
78.250	-42.43692	-83.22565	-1.20294	-41.99167	-42.43686
78.500	-43.82844	-85.61696	-2.59446	-44.38298	-43.82846
78.750	-45.65669	-83.27556	-4.42271	-44.04158	-45.65652
79.000	-46.84640	-81.71773	-5.61242	-40.48375	-46.84529
79.250	-46.44814	-78.36185	-5.21416	-37.12787	-46.44565
79.500	-45.47064	-75.85896	-4.23666	-34.62498	-45.46698
79.750	-45.07537	-74.06854	-3.84139	-32.83456	-45.07020
80.000	-45.71128	-72.83766	-4.47730	-31.60369	-45.70318
80.250	-47.60342	-72.05457	-6.36944	-30.82059	-47.50817
80.500	-50.60133	-71.62776	-9.36735	-30.39378	-50.56748
80.750	-51.64811	-71.46302	-10.41413	-30.22904	-51.60333
81.000	-48.85273	-71.44598	-7.61876	-30.21200	-48.82920
81.250	-46.48231	-71.44202	-5.24833	-30.20804	46.46877
81.500	-45.58507	-71.33244	-4.35110	-30.09846	-45.57383
81.750	-46.22841	-71.07810	-4.99443	-29.84412	-46.21452
82.000	-48.75471	-70.74922	-7.52073	-29.51524	-48.72767
82.250	-53.64275	-70.48417	-12.40877	-29.25019	-53.55410
82.500	-52.77895	-70.42660	-11.54497	-29.19262	-52.70524
82.750	-47.36915	-70.68952	-6.13517	-29.45554	-47.34928
83.000	-44.28841	-71.32819	-3.05443	-30.09421	-44.28014
83.250	-42.84095	-72.24053	-1.60697	-31.00655	-42.83627
83.500	-42.46438	-72.87378	-1.23040	-31.63980	-42.46073
83.750	-42.64133	-72.19069	-1.40735	-30.95671	-42.63382
84.000	-42.75016	-70.10310	-1.51618	-28.86913	-42.74248
84.250	-42.62350	-67.61659	-1.38952	-26.38261	-42.61007
84.500	-43.12814	-65.32015	-1.89416	-24.08617	-43.10231
84.750	-46.31424	-63.31224	-5.08026	-22.07826	-46.27871
85.000	-62.43133	-61.51653	-21.19735	-20.28255	-58.[illegible]
85.250	-40.82872	-59.81386	.40523	-18.57788	-40.77450
85.500	-33.14549	-58.09830	8.08849	-16.86433	-33.13193
85.750	-28.16740	-56.31555	13.06658	-15.08157	-28.16106
86.000	-24.47293	-54.47614	16.76105	-13.24217	-24.46890
86.250	-21.56351	-52.63471	19.67047	-11.40073	-21.56042
86.500	-19.17081	-50.85577	22.06317	-9.62179	-19.16817
86.750	-17.10287	-49.19098	24.13111	-7.95700	-17.10049
87.000	-15.20211	-47.67312	26.03187	-6.43914	-15.19995
87.250	-13.34724	-46.31900	27.88474	-5.08502	-13.34735
87.500	-11.48499	-45.13459	29.74899	-3.90062	-11.48342
87.750	-9.61740	-44.11929	31.61658	-2.88531	-9.61616
88.000	-7.79939	-43.26876	33.43459	-2.03478	-7.79846
88.250	-6.09471	-42.57669	35.13927	-1.34271	-6.09403
88.500	-4.55564	-42.03580	36.67834	-.80182	-4.55517
88.750	-3.21706	-41.63848	38.01692	-.40450	-3.21674
89.000	-2.09938	-41.37713	39.13460	-.14315	-2.09917
89.250	-1.21362	-41.24450	40.02036	-.01052	-1.21349
89.500	-.56580	-41.23378	40.66818	0.00000	-.56573
89.750	-.15993	-41.33993	41.07405	-.10595	-.15991
90.000	0.00000	-41.55805	41.23398	-.32407	0.00000

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1264460E+00)= 12.3115234

20LOG(MAX(FIELD-Y))=20LOG(3.5799518E-02)= -28.9224563

C100. Concluded.

ORIGINAL PAGE IS OF POOR QUALITY

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 90.000 TO 102.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
90.000	0.00000	-41.55805	41.55805	0.00000	0.00000
90.250	-.07118	-41.88572	41.46687	-.32768	-.07119
90.500	-.44061	-42.32236	41.11743	-.76432	-.44063
90.750	-1.05777	-42.86960	40.50027	-1.31155	-1.05779
91.000	-1.95420	-43.53135	39.60385	-1.97330	-1.95420
91.250	-3.14181	-44.31377	38.41624	-2.75572	-3.14178
91.500	-4.62780	-45.22499	36.93024	-3.66694	-4.62773
91.750	-6.40109	-46.27474	35.15696	-4.71670	-6.40075
92.000	-8.40065	-47.47387	33.15739	-5.91582	-8.40042
92.250	-10.45880	-48.83357	31.09924	-7.27553	-10.45848
92.500	-12.26856	-50.36437	29.28948	-8.80633	-12.26817
92.750	-13.54549	-52.07430	28.01256	-10.51625	-13.54518
93.000	-14.34687	-53.96581	27.21117	-12.40776	-14.34670
93.250	-15.03784	-56.03062	26.52021	-14.47257	-15.03780
93.500	-15.97558	-58.24204	25.58247	-16.68400	-15.97563
93.750	-17.39930	-60.54706	24.15874	-18.98902	-17.39940
94.000	-19.49799	-62.86761	22.06005	-21.30957	-19.49809
94.250	-22.51560	-65.12920	19.04245	-23.57116	-22.51566
94.500	-26.90642	-67.32346	14.65163	-25.76541	-26.90632
94.750	-33.48079	-69.56765	8.07726	-28.01161	-33.48002
95.000	-37.36637	-72.14063	4.19167	-30.58259	-37.36523
95.250	-33.48302	-75.51691	8.07502	-33.95887	-33.48305
95.500	-31.75315	-80.63714	9.80490	-39.07909	-31.75339
95.750	-31.97115	-86.40514	9.58689	-44.84710	-31.97144
96.000	-33.53576	-80.71598	8.02228	-39.15794	-33.53598
96.250	-35.34157	-75.92431	6.21647	-34.36627	-35.34147
96.500	-35.04897	-72.96198	6.50907	-31.40394	-35.04857
96.750	-33.14172	-71.00019	8.41632	-29.44214	-33.14131
97.000	-31.67746	-69.68287	9.88058	-28.12483	-31.67708
97.250	-31.21187	-68.84137	10.34617	-27.28333	-31.21143
97.500	-31.82675	-68.38726	9.73130	-26.82921	-31.82607
97.750	-33.67617	-68.27078	7.88187	-26.71273	-33.67497
98.000	-37.21697	-68.46199	4.34108	-26.90395	-37.21401
98.250	-43.11302	-68.94061	-1.55498	-27.38257	-43.10199
98.500	-43.14625	-69.68916	-1.58820	-28.13112	-43.13694
98.750	-38.23964	-70.68710	3.31841	-29.12906	-38.23747
99.000	-35.73878	-71.90535	5.81927	-30.34730	-35.73803
99.250	-34.96007	-73.30303	6.59797	-31.74498	-34.95974
99.500	-35.57026	-74.83225	5.98778	-33.27420	-35.57005
99.750	-37.69391	-76.45840	3.86414	-34.90035	-37.69363
100.000	-42.23127	-78.19346	-.67323	-36.63541	-42.23048
100.250	-55.58065	-80.11068	-14.02261	-38.55264	-55.56568
100.500	-47.36865	-82.25528	-5.81060	-40.69724	-47.36754
100.750	-40.77536	-84.19852	.78269	-42.64047	-40.77546
101.000	-38.17314	-84.36571	3.38491	-42.80767	-38.17334
101.250	-37.36827	-82.31733	4.18978	-40.75929	-37.36843
101.500	-37.87988	-79.80992	3.67617	-38.25187	-37.87991
101.750	-39.66125	-77.71243	1.89680	-36.15438	-39.66087
102.000	-42.80858	-76.13031	-1.25054	-34.57226	-42.80637

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1264460E+00)= 12.3115234

20LOG(MAX(FIELD-Y))=20LOG(3.4808458E-02)= -[illegible]

Distribution C200.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-43.19784	-60.463[illegible]	-19.13831	-36.40365	-43.11734
-11.750	-41.55788	-67.35704	-17.49835	-43.29752	-41.54673
-11.500	-41.37040	-68.08534	-17.31087	-44.02581	-41.36141
-11.250	-42.68603	-59.77446	-18.62651	-35.71493	-42.60221
-11.000	-46.20884	-55.89282	-22.149[illegible]	-31.83329	-45.76547
-10.750	-53.40993	-54.00854	-29.35041	-29.94901	-50.63889
-10.500	-48.05484	-53.51017	-23.99531	-29.45054	-45.96691
-10.250	-42.03194	-54.34231	-17.97241	-30.28278	-41.78429
-10.000	-38.85677	-56.90015	-14.79725	-32.84062	-38.73942
-9.750	-37.27337	-62.49421	-13.21384	-38.43468	-37.26059
-9.500	-36.89750	-64.65219	-12.83797	-40.59266	-36.87048
-9.250	-37.69672	-57.28304	-13.63719	-33.22351	-37.64947
-9.000	-39.90666	-53.37420	-15.84713	-29.31467	-39.71574
-8.750	-43.87597	-51.48028	-19.81644	-27.42075	-43.18100
-8.500	-45.71201	-51.03340	-21.65248	-26.97387	-44.59403
-8.250	-41.23746	-52.03277	-17.17793	-27.97323	-40.89037
-8.000	-37.88948	-55.07795	-13.82995	-31.01842	-37.80755
-7.750	-36.27323	-62.65341	-12.21370	-38.59389	-36.26351
-7.500	-36.13770	-60.71979	-12.07817	-36.65026	-36.12[illegible]
-7.250	-37.66652	-53.06060	-13.60699	-29.00107	-37.54313
-7.000	-42.06451	-49.41897	-18.00498	-25.35944	-41.37166
-6.750	-64.81788	-47.71022	-40.75835	-23.65069	-47.62676
-6.500	-42.08054	-47.46654	-18.02102	-23.40701	-40.97715
-6.250	-35.86686	-48.83118	-11.80734	-24.77165	-35.65303
-6.000	-32.71104	-52.39624	-8.85151	-28.83671	-32.[illegible]794
-5.750	-31.69368	-66.45504	-7.63415	-42.37551	-31.69249
-5.500	-31.97350	-53.04448	-7.91397	-28.98495	-31.93995
-5.250	-34.15858	-46.60883	-10.07905	-22.54930	-33.91857
-5.000	-40.52530	-43.39379	-16.46577	-19.33426	-38.71686
-4.750	-47.39471	-41.90006	-23.33518	-17.84054	-40.82082
-4.500	-34.23020	-41.88932	-10.17067	-17.82979	-33.54330
-4.250	-29.55617	-43.78079	3.49665	-19.72126	-29.39528
-4.000	-27.45502	-49.36089	-3.39549	-25.30136	-27.42737
-3.750	-27.31928	-48.24071	-3.25975	-24.18118	-27.28455
-3.500	-29.92751	-39.43514	-5.86798	-15.37561	-29.46671
-3.250	-39.10926	-34.27685	-15.04973	-10.21732	-33.04294
-3.000	-27.24426	-30.77553	-3.18474	-6.71601	-25.65042
-2.750	-19.46406	-28.25053	4.59547	-4.19101	-18.92495
-2.500	-14.51154	-26.41987	9.54799	-2.36034	-14.24058
-2.250	-10.87114	-25.14784	13.18839	-1.08831	-10.71213
-2.000	-8.04032	-24.36861	16.01920	-.30908	-7.94060
-1.750	-5.78970	-24.05953	18.26983	0.00000	-5.72575
-1.500	-3.79481	-24.23433	20.06472	-.17480	-3.75417
-1.250	-2.58093	-24.95037	21.47860	-.89034	-2.55610
-1.000	-1.50044	-26.33727	22.55909	-2.27774	-1.48647
-.750	-.72220	-28.68334	23.33732	-4.62381	-.71553
-.500	-.22607	-32.76070	23.83344	-8.70117	-.22393
-.250	0.00000	-42.19098	24.05753	-18.13146	0.00000
0.000	-.03828	-41.87317	24.02124	-17.81364	-.03826

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1052941E+00)= 12.2668855

20LOG(MAX(FIELD-Y))=20LOG(2.5725741E-01)= -11.7926422

ORIGINAL PAGE IS
OF POOR QUALITY

C200. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	0.00000	-41.83488	24.25051	-17.58438	0.00000
.250	-.30275	-32.66926	23.94775	-8.41875	-.30052
.500	-.87578	-28.67775	23.37473	-4.42725	-.86886
.750	-1.73119	-26.37123	22.51932	-2.13073	-1.71664
1.000	-2.88885	-25.05462	21.36166	-.80411	-2.86283
1.250	-4.37902	-24.38389	19.87149	[illegible]	-4.33614
1.500	-6.24719	-24.25051	18.00332	0.00000	-6.17923
1.750	-8.56308	-24.59670	15.68743	-.34617	-8.45644
2.000	-11.43897	-25.40691	12.81153	-1.15641	-11.26848
2.250	-15.07124	-26.69986	9.17926	-2.44935	-14.78085
2.500	-19.85129	-28.53312	4.39922	-4.28262	-19.27985
2.750	-26.72048	-31.02391	-2.46997	-6.77341	-25.34962
3.000	-36.45547	-34.40616	-12.20496	-10.15566	-32.30103
3.250	-33.22728	-39.20080	-8.97677	-14.95030	-32.24901
3.500	-30.99587	-46.73774	-6.74537	-22.48724	-30.88190
3.750	-31.92652	-51.80805	-7.67601	-27.55755	-31.88240
4.000	-35.92928	-46.36531	-11.67877	-22.11480	-35.55351
4.250	-47.62051	-44.35204	-23.37000	-20.10154	-42.67578
4.500	-40.03641	-44.51668	-15.78590	-20.26618	-38.71772
4.750	-33.89972	-46.44068	-9.64922	-22.19017	-33.66458
5.000	-31.45737	-50.62897	-7.20687	-26.37846	-31.40542
5.250	-30.79443	-59.61230	-6.54392	-35.36180	-30.78792
5.500	-31.46866	-57.01365	-7.21815	-32.76314	-31.45684
5.750	-33.51190	-50.96062	-9.26139	-26.71012	-33.47473
6.000	-37.47344	-48.58536	-13.22293	-24.33485	-37.14990
6.250	-45.41406	-48.06084	-21.16355	-23.81033	-43.52884
6.500	-46.35250	-48.95708	-22.10200	-24.70657	-44.45238
6.750	-39.63711	-51.37137	-15.38860	-27.12086	-39.35731
7.000	-37.03131	-55.97796	-12.78081	-31.72745	-36.97660
7.250	-36.45790	-62.28391	-12.20739	-38.03341	-36.44684
7.500	-37.44139	-57.73422	-13.19118	-33.48372	-37.40156
7.750	-40.15031	-53.66132	-15.89980	-29.41081	-39.96128
8.000	-45.45092	-51.92994	-21.20041	-27.67944	-44.57000
8.250	-49.23911	-51.75787	-24.98860	-27.50732	-47.30835
8.500	-43.28682	-52.96091	-19.03632	-28.71040	-42.84252
8.750	-39.87111	-55.79231	-15.62060	-31.54180	-39.76170
9.000	-38.49991	-61.14233	-14.24940	-36.89182	-38.47662
9.250	-38.60047	-65.26932	-14.34997	-41.01881	-38.59142
9.500	-40.14415	-59.43343	-15.89364	-35.18293	-40.09358
9.750	-43.70352	-56.05402	-19.45301	-31.80351	-43.45811
10.000	-52.38371	-54.75197	-28.13321	-30.50146	-50.39836
10.250	-54.52520	-54.96090	-30.27469	-30.71040	-51.72757
10.500	-44.93176	-56.68800	-20.68125	-32.43749	-44.65146
10.750	-41.47781	-60.63391	-17.22730	-36.38341	-41.42567
11.000	-40.14293	-70.48370	-15.89242	-46.23320	-40.13920
11.250	-40.21326	-66.96660	-15.96276	-42.71610	-40.20478
11.500	-41.59055	-59.83862	-17.34005	-35.58811	-41.57631
11.750	-44.54564	-56.90879	-20.29514	-32.65829	-44.30093
12.000	-49.45074	-55.86408	-25.20023	-31.61358	-48.55738

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.0873394E+00)= 12.2286014

20LOG(MAX(FIELD-Y))=20LOG(2.5055597E-01)= -12.0219048

ORIGINAL PAGE IS
OF POOR QUALITY

C200. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 78.000 TO 90.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
78.000	-52.68129	-76.24329	-11.21081	-34.79282	-52.64758
78.250	-45.98732	-77.23217	-4.53685	-35.78170	-45.98435
78.500	-42.68574	-78.47616	-1.23527	-37.02562	-42.68488
78.750	-41.00117	-80.05299	.44931	-38.60252	-41.00091
79.000	-40.48030	-82.12799	.97018	-40.67751	-40.48028
79.250	-41.03027	-85.03145	.42020	-43.58098	-41.03038
79.500	-42.78913	-89.30634	-1.31363	-47.85587	-42.77932
79.750	-45.94255	-92.86316	-4.49208	-51.41269	-45.94275
80.000	-49.28250	-88.59003	-7.83203	-47.13956	-49.28227
80.250	-47.14082	-84.24763	-5.67035	-42.79716	-47.14076
80.500	-43.66931	-81.35674	-2.21884	-39.90627	-43.66886
80.750	-41.68591	-79.42004	-.23544	-37.96957	-41.68546
81.000	-41.06237	-78.14158	.38810	-36.59120	-41.06180
81.250	-41.64728	-77.34987	-.19681	-35.89740	-41.64640
81.500	-43.28878	-76.91899	-1.83031	-35.46852	-43.28719
81.750	-44.88722	-76.72505	-3.43675	-35.27458	-44.88466
82.000	-43.77969	-76.61590	-2.32922	-35.16543	-43.77771
82.250	-41.10671	-76.40273	.34376	-34.95226	-41.10571
82.500	-39.09632	-75.90297	2.35415	-34.45250	-39.09570
82.750	-38.16384	-75.03573	3.28663	-33.58526	-38.16323
83.000	-38.32230	-73.87617	3.12817	-32.42570	-38.32137
83.250	-39.58255	-72.59468	1.86792	-31.14421	-39.58066
83.500	-41.69600	-71.35969	-.24552	-29.90922	-41.69159
83.750	-42.87032	-70.28798	-1.41984	-28.83751	-42.86274
84.000	-41.36614	-69.43031	.08433	-27.97984	-41.35965
84.250	-39.71979	-68.72998	1.73069	-27.27951	-39.71462
84.500	-39.76323	-67.96964	1.68724	-26.51916	-39.75695
84.750	-43.12686	-66.72680	-1.67637	-25.27633	-43.10823
85.000	-57.48699	-64.68812	-16.03652	-23.23765	-56.72999
85.250	-38.12029	-62.04423	3.33018	-20.59376	-38.10301
85.500	-31.00324	-59.23624	10.44723	-17.78577	-30.99701
85.750	-26.54363	-56.55787	14.90684	-15.10742	-26.53959
86.000	-23.35885	-54.12385	18.09162	-12.67338	-23.35549
86.250	-20.94897	-51.95873	20.50150	-10.50826	-20.94582
86.500	-19.02238	-50.05373	22.42809	-8.60326	-19.01924
86.750	-17.33605	-48.39019	24.11442	-6.93972	-17.33293
87.000	-15.66463	-46.94815	25.78585	-5.49767	-15.66153
87.250	-13.85134	-45.70900	27.59913	-4.25852	-13.84880
87.500	-11.87544	-44.65613	29.57504	-3.20566	-11.87343
87.750	-9.83495	-43.77484	31.61552	-2.32436	-9.83348
88.000	-7.85878	-43.05207	33.59169	-1.60160	-7.85775
88.250	-6.04394	-42.47618	35.40653	-1.02571	-6.04324
88.500	-4.44490	-42.03575	37.00558	-.58627	-4.44437
88.750	-3.08602	-41.72451	38.36445	-.27404	-3.08571
89.000	-1.97524	-41.53136	39.47523	-.08089	-1.97505
89.250	-1.11301	-41.45047	40.33746	0.00000	-1.11290
89.500	-.49734	-41.47640	40.95313	-.02593	-.49728
89.750	-.12643	-41.60527	41.32404	-.15480	-.12641
90.000	0.00000	-41.83488	41.45047	-.38441	0.00000

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.0877394E+00)= 12.2286014

20LOG(MAX(FIELD-Y))=20LOG(3.4586492E-02)= -29.2218698

ORIGINAL PAGE IS
OF POOR QUALITY

C200. Concluded.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 90.000 TO 102.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
90.000	0.00000	-41.83488	41.83488	0.00000	0.00000
90.250	-.12003	-42.16478	41.71485	-.32990	-.12004
90.500	-.49112	-42.59619	41.34376	-.76131	-.49114
90.750	-1.12058	-43.13185	40.71430	-1.29698	-1.12059
91.000	-2.01799	-43.77582	39.81689	-1.94094	-2.01798
91.250	-3.19363	-44.53303	38.64126	-2.69815	-3.19359
91.500	-4.65390	-45.40897	37.18098	-3.57408	-4.65382
91.750	-6.38966	-46.40920	35.44523	-4.57432	-6.38951
92.000	-8.34919	-47.53891	33.48570	-5.70403	-8.34895
92.250	-10.38856	-48.80227	31.44633	-6.96738	-10.38822
92.500	-12.23301	-50.20182	29.60138	-8.36694	-12.23260
92.750	-13.59091	-51.73762	28.24398	-9.90273	-13.59052
93.000	-14.44907	-53.40611	27.38581	-11.57123	-14.44881
93.250	-15.11927	-55.19879	26.71561	-13.36391	-15.11913
93.500	-15.95640	-57.10041	25.87848	-15.26553	-15.95635
93.750	-17.20807	-59.08681	24.62681	-17.25193	-17.20807
94.000	-19.05628	-61.12224	22.77860	-19.28735	-19.05629
94.250	-21.71032	-63.15648	20.12456	-21.32160	-21.71030
94.500	-25.53941	-65.12320	16.29538	-23.28832	-25.53921
94.750	-31.35334	-66.94389	10.48154	-25.10901	-31.35243
95.000	-38.65846	-68.54400	3.17642	-26.70912	-38.65429
95.250	-35.17222	-69.88135	6.66267	-28.04646	-35.17103
95.500	-32.19038	-70.96869	9.64450	-29.13381	-32.19009
95.750	-31.62196	-71.86687	10.21292	-30.03199	-31.62184
96.000	-32.82376	-72.65214	9.01112	-30.81725	-32.82359
96.250	-35.76455	-73.38541	6.07033	-31.55053	-35.76408
96.500	-39.69233	-74.10135	2.14255	-32.26646	-39.69104
96.750	-38.50113	-74.81551	3.33371	-32.98063	-38.50045
97.000	-34.84745	-75.53895	6.98743	-33.70407	-34.84737
97.250	-32.66142	-76.28809	9.17347	-34.45320	-32.66151
97.500	-31.81592	-77.08039	10.01896	-35.24550	-31.81608
97.750	-32.09052	-77.91328	9.74436	-36.07840	-32.09069
98.000	-33.47838	-78.73234	8.35650	-36.89746	-33.47854
98.250	-36.24099	-79.41149	5.59389	-37.57660	-36.24107
98.500	-41.20944	-79.79590	.62544	-37.96102	-41.20913
98.750	-48.54027	-79.82743	-6.70539	-37.99255	-48.53733
99.000	-43.37370	-79.62428	-1.53882	-37.78940	-43.37296
99.250	-39.10839	-79.40011	2.72649	-37.56523	-39.10827
99.500	-37.29958	-79.34417	4.53530	-37.50929	-37.29960
99.750	-36.99999	-79.58191	4.83489	-37.74703	-37.00004
100.000	-37.94022	-80.18871	3.89466	-38.35383	-37.94025
100.250	-40.20834	-81.20294	1.62654	-39.36806	-40.20828
100.500	-44.32352	-82.60179	-2.48864	-40.76691	-44.32316
100.750	-51.15539	-84.18330	-9.32050	-42.34842	-51.15351
101.000	-50.43851	-85.34137	-8.60363	-43.50649	-50.43739
101.250	-45.82154	-85.31513	-3.98666	-43.48025	-45.82134
101.500	-43.99910	-84.28041	-2.16422	-42.44552	-43.99898
101.750	-44.14974	-83.04176	-2.31486	-41.20688	-44.14947
102.000	-46.26853	-82.05058	-4.43368	-40.21567	-46.26770

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.0872394E+00)= 12.2286014

20LOG(MAX(FIELD-Y))=20LOG(3.3089177E-02)= -29.6062806

Distribution C3C0.

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-43.17707	-61.51811	-19.12107	-37.46211	-43.11416
-11.750	-41.71328	-68.70637	-17.65728	-44.65037	-41.70486
-11.500	-41.70660	-65.22808	-17.65060	-41.17208	-41.[illegible]8759
-11.250	-43.30197	-58.65657	-19.24577	-34.60057	-43.17747
-11.000	-47.46753	-55.31773	-23.41154	-31.26173	-46.80807
-10.750	-55.20190	-53.72295	-31.14590	-29.66695	-51.38972
-10.500	-46.76025	-53.45772	-22.70426	-2[illegible].40172	-45.9[illegible]361
-10.250	-41.23406	-54.56874	-17.17807	-30.51274	-41.03734
-10.000	-38.31741	-57.65246	-14.26141	-33.59646	-3[illegible].[illegible]6734
-9.750	-36.89611	-65.13762	-12.84011	-41.08162	-36.8[illegible]
-9.500	-36.65643	-64.16835	-12.60043	-40.11235	-36.64899
-9.250	-37.62169	-56.27326	-13.56569	-32.21726	-37.56310
-9.000	-40.16199	-52.56821	-16.10599	-28.51221	-39.[illegible]950
-8.750	-45.29710	-50.79198	-21.24110	-26.73599	-44.21790
-8.500	-48.29871	-50.39990	-24.24271	-26.34390	-46.21341
-8.250	-41.74014	-51.39332	-17.68414	-27.33732	-41.29377
-8.000	-37.95605	-54.31404	-13.90005	-30.25805	-37.85699
-7.750	-36.23419	-61.24422	-12.17819	-37.18822	-36.22077
-7.500	-36.07177	-60.96192	-12.01577	-36.90592	-36.05796
-7.250	-37.59774	-53.17238	-13.54174	-29.11638	-37.47932
-7.000	-41.95153	-49.45296	-17.89553	-25.38696	-41.24118
-6.750	-54.23298	-47.72124	-30.17698	-23.66524	-46.84628
-6.500	-41.45167	-47.48169	-17.39567	-23.42569	-40.48471
-6.250	-35.56011	-48.87465	-11.50411	-24.81865	-35.36249
-6.000	-32.58327	-53.01123	-8.52727	-28.95523	-32.54344
-5.750	-31.49904	-65.31202	-7.44304	-41.25602	-31.49749
-5.500	-31.79201	-52.59262	-7.73601	-28.53662	-31.75630
-5.250	-33.96820	-46.37526	-9.91221	-22.31726	-33.72586
-5.000	-40.22551	-43.22501	-16.16951	-19.16901	-38.46125
-4.750	-47.31176	-41.76289	-23.25576	-17.70689	-40.69551
-4.500	-34.20291	-41.77032	-10.14691	-17.71432	-3[illegible].50246
-4.250	-29.51610	-43.67106	-5.46010	-19.61506	-29.35264
-4.000	-27.41392	-49.25931	-3.35792	-25.20331	-27.[illegible]587
-3.750	-27.28385	-48.24744	-3.22785	-24.19144	-27.24940
-3.500	-29.91744	-39.40885	-5.86144	-15.35286	-29.45499
-3.250	-39.59504	-34.24682	-15.53904	-10.19082	-33.13491
-3.000	-27.26995	-30.74791	-3.21395	-6.69191	-2[illegible].[illegible]966
-2.750	-19.45117	-28.22708	4.60482	-4.17108	-18.91082
-2.500	-14.49414	-26.40118	9.56186	-2.34518	-14.22310
-2.250	-10.85428	-25.13412	13.20171	-1.07813	-10.[illegible]7539
-2.000	-8.02539	-24.35995	16.03060	-.30395	-7.97580
-1.750	-5.77712	-24.05600	18.27888	0.00000	-5.71330
-1.500	-3.98469	-24.23609	20.07131	-.18009	-3.94415
-1.250	-2.57320	-24.95779	21.48280	-.90179	-2.54845
-1.000	-1.49497	-26.35122	22.56103	-2.29522	-1.48105
-.750	-.71880	-28.70599	23.33720	-4.64999	-.71[illegible]
-.500	-.22452	-32.79903	23.83148	-8.74303	-.22238
-.250	0.00000	-42.29381	24.05600	-18.23781	0.00000
0.000	-.03955	-41.78941	24.01645	-17.73341	-.03952

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.1053473E+00)= 12.[illegible]980

20LOG(MAX(FIELD-Y))=20LOG(2.57[illegible]E-01)= -11.78[illegible]05

ORIGINAL PAGE IS OF POOR QUALITY

C300. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	0.00000	-41.74986	24.26118	-17.48368	0.00000
.250	-.30367	-32.64991	23.95751	-8.38873	-.30144
.500	-.87722	-28.67307	23.38396	-4.41189	-.87030
.750	-1.73258	-26.39356	22.52851	-2.13238	-1.71814
1.000	-2.88981	-25.06114	21.37138	-.79995	-2.86383
1.250	-4.37872	-24.39304	19.88246	-.13186	-4.33594
1.500	-6.24467	-24.26118	18.01652	0.00000	-6.17392
1.750	-8.55697	-24.60739	15.70421	-.34671	-8.45076
2.000	-11.42719	-25.41758	12.83399	-1.15639	-11.25757
2.250	-15.05028	-26.70871	9.21091	-2.44753	-14.76780
2.500	-19.81453	-28.53839	4.44665	-4.27721	-19.26809
2.750	-26.65787	-31.02274	-2.39669	-6.76156	-25.30357
3.000	-36.58245	-34.39297	-12.32127	-10.13179	-32.34116
3.250	-33.43246	-39.16059	-9.17128	-14.89940	-32.40356
3.500	-31.11573	-46.60222	-6.85455	-22.34104	-30.99495
3.750	-32.02740	-51.67122	-7.75621	-27.41004	-31.98000
4.000	-36.06944	-46.36120	-11.80826	-22.10002	-35.68153
4.250	-48.77409	-44.33488	-24.51291	-20.07370	-43.00038
4.500	-40.07709	-44.45500	-15.81590	-20.20382	-38.77075
4.750	-33.85735	-46.32291	-9.59617	-22.06173	-33.61820
5.000	-31.38504	-50.34826	-7.12386	-26.08708	-31.33053
5.250	-30.68249	-58.69996	-6.42131	-34.43878	-30.67593
5.500	-31.29011	-57.55608	-7.02893	-33.29490	-31.28015
5.750	-33.19887	-51.36381	-8.93769	-27.10263	-33.17339
6.000	-36.79044	-48.91588	-[illegible].52926	-24.65469	-36.53236
6.250	-42.88736	-48.36837	-[illegible].62618	-24.10719	-41.80514
6.500	-44.41112	-49.27272	-20.14994	-25.01154	-43.18444
6.750	-39.44721	-51.72642	-15.18602	-27.46524	-39.19785
7.000	-37.02653	-56.37219	-12.76534	-32.11100	-36.97662
7.250	-36.48019	-61.68976	-12.21901	-37.42857	-36.46741
7.500	-37.46658	-57.01085	-13.20540	-32.74967	-37.41890
7.750	-40.22529	-53.24487	-15.96411	-28.98369	-40.01413
8.000	-46.18310	-51.61539	-21.92192	-27.35421	-45.09008
8.250	-55.64801	-51.46712	-31.38682	-27.20594	-50.06775
8.500	-44.88929	-52.64605	-20.62811	-28.38487	-44.21657
8.750	-40.72200	-55.40430	-16.46082	-31.14312	-40.57699
9.000	-39.13899	-60.70690	-14.87781	-36.44572	-39.10912
9.250	-39.17829	-66.64580	-14.91711	-42.38462	-39.17081
9.500	-40.75733	-60.27528	-16.49614	-36.01410	-40.70936
9.750	-44.52267	-56.51972	-20.26149	-32.25854	-44.25706
10.000	-54.47330	-55.06413	-30.21212	-30.80295	-51.74867
10.250	-52.61987	-55.18811	-28.35868	-30.92693	-50.70684
10.500	-44.30103	-56.85219	-20.03985	-32.59101	-44.06643
10.750	-41.05830	-60.71308	-16.79712	-36.45190	-41.01182
11.000	-39.77129	-69.85734	-15.51011	-45.59616	-39.76732
11.250	-39.81299	-66.65835	-15.55181	-42.39717	-39.80431
11.500	-41.08095	-59.81261	-16.81977	-35.55143	-41.02347
11.750	-43.76461	-56.89474	-19.50343	-32.63356	-43.55864
12.000	-48.02583	-55.82728	-23.76465	-31.56610	-47.33950

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.0866959E+00)= 12.2274464

20LOG(MAX(FIELD-Y))=20LOG(2.5021494E-01)= -12.0337351

ORIGINAL PAGE IS
OF POOR QUALITY

C300. Continued.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 78.000 TO 90.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
78.000	-55.28146	-74.34676	-13.89769	-32.96299	-55.22822
78.250	-46.89975	-74.75217	-5.51598	-33.36840	-46.89292
78.500	-43.18568	-75.74569	-1.80191	-34.36192	-43.18356
78.750	-41.33009	-77.50229	.05368	-36.11852	-41.32933
79.000	-40.72434	-80.41813	.65943	-39.03436	-40.72417
79.250	-41.23077	-85.63717	.15300	-44.25340	-41.23090
79.500	-42.94875	-96.99830	-1.56498	-55.61453	-42.94702
79.750	-46.09325	-87.45623	-4.70948	-46.07246	-46.09322
80.000	-49.22360	-81.83193	-7.83983	-40.44816	-49.22151
80.250	-46.93546	-78.99610	-5.55169	-37.61233	-46.93305
80.500	-43.52203	-77.49711	-2.13826	-36.11334	-43.52058
80.750	-41.57035	-76.87499	-.18658	-35.49122	-41.56936
81.000	-40.95289	-76.92954	.43088	-35.54577	-40.95208
81.250	-41.52019	-77.53837	-.13642	-36.15460	-41.51939
81.500	-43.10488	-78.56802	-1.72111	-37.18425	-43.10394
81.750	-44.60554	-79.80671	-3.22177	-38.42294	-44.60452
82.000	-43.50570	-80.98298	-2.12193	-39.59921	-43.50521
82.250	-40.89262	-81.98163	.49115	-40.59786	-40.89257
82.500	-38.89714	-82.98097	2.48663	-41.59720	-38.89726
82.750	-37.94252	-83.87363	3.44125	-42.48986	-37.94270
83.000	-38.04415	-83.03880	3.33962	-41.65503	-38.04430
83.250	-39.20674	-79.72861	2.17703	-38.34484	-39.20665
83.500	-41.22996	-76.06361	.15381	-34.67984	-41.22082
83.750	-42.65256	-73.03648	-1.26879	-31.65271	-42.64887
84.000	-41.61228	-70.70423	-.22851	-29.32046	-41.60722
84.250	-40.14581	-68.93654	1.23796	-27.55277	-40.14037
84.500	-40.29556	-67.53543	1.08821	-26.15166	-40.28766
84.750	-43.98273	-66.19922	-2.59896	-24.81545	-43.95703
85.000	-59.63740	-64.54889	-18.25363	-23.16512	-58.47295
85.250	-37.95771	-62.37008	3.42606	-20.98631	-37.94230
85.500	-31.00299	-59.81015	10.38078	-18.42638	-30.99757
85.750	-26.60690	-57.17505	14.77687	-15.79128	-26.60338
86.000	-23.45648	-54.68021	17.92729	-13.29644	-23.45349
86.250	-21.06727	-52.41883	20.31650	-11.03506	-21.06430
86.500	-19.15027	-50.41440	22.23350	-9.03063	-19.14731
86.750	-17.46023	-48.66087	23.92354	-7.27710	-17.45722
87.000	-15.76983	-47.14204	25.61394	-5.75827	-15.76696
87.250	-13.92654	-45.83947	27.45723	-4.45570	-13.92404
87.500	-11.91963	-44.73534	29.46414	-3.35157	-11.91765
87.750	-9.85520	-43.81337	31.52857	-2.42960	-9.85375
88.000	-7.86401	-43.05889	33.51976	-1.67512	-7.86299
88.250	-6.04117	-42.45872	35.34260	-1.07495	-6.04047
88.500	-4.43866	-42.00105	36.94511	-.61728	-4.43817
88.750	-3.07894	-41.67532	38.30483	-.29155	-3.07863
89.000	-1.96876	-41.47222	39.41501	-.08845	-1.96856
89.250	-1.10785	-41.38377	40.27592	0.00000	-1.10773
89.500	-.49383	-41.40348	40.88994	-.01971	-.49377
89.750	-.12468	-41.52652	41.25907	-.14275	-.12466
90.000	0.00000	-41.74986	41.38377	-.36609	0.00000

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.0866959E+00)= 12.2274464

20LOG(MAX(FIELD-Y))=20LOG(3.4843478E-02)= -29.1567236

ORIGINAL PAGE IS
OF POOR QUALITY

C300. Concluded.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS PHI = 0.000 DEG

ANGLE THETA FROM 90.000 TO 102.000 BY .250 DEG

THETA	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
90.000	0.00000	-41.74986	41.74986	0.00000	0.00000
90.250	-.12170	-42.07240	41.62816	-.32254	-.12172
90.500	-.49436	-42.49490	41.25550	-.74504	-.49437
90.750	-1.12525	-43.01989	40.62461	-1.27003	-1.12526
91.000	-2.02400	-43.65135	39.72586	-1.90149	-2.02399
91.250	-3.20094	-44.39444	38.54892	-2.64458	-3.20090
91.500	-4.66268	-45.25501	37.08718	-3.50515	-4.66259
91.750	-6.40057	-46.23917	35.34929	-4.48931	-6.40041
92.000	-8.36404	-47.35281	33.38582	-5.60295	[illegible]
92.250	-10.41139	-48.60102	31.33847	-6.85116	-10.41102
92.500	-12.27023	-49.98744	29.47963	-8.23758	-12.26979
92.750	-13.64768	-51.51344	28.10218	-9.76358	-13.64726
93.000	-14.52480	-53.17701	27.22506	-11.42715	-14.52450
93.250	-15.21041	-54.97129	26.53945	-13.22143	-15.21024
93.500	-16.06152	-56.88273	25.68834	-15.13287	-16.06145
93.750	-17.32940	-58.88870	24.42046	-17.13884	-17.32739
94.000	-19.20017	-60.95502	22.54969	-19.20516	-19.20017
94.250	-21.88962	-63.03436	19.86024	-21.28450	-21.88957
94.500	-25.78184	-65.06790	15.96802	-23.31804	-25.78152
94.750	-31.72466	-66.99471	10.02520	-25.24485	-31.72366
95.000	-38.86516	-68.77192	2.88470	-27.02206	-38.86101
95.250	-35.00860	-70.39973	6.74126	-28.64988	-35.00764
95.500	-32.15803	-71.93442	9.59183	-30.18456	-32.15787
95.750	-31.70777	-73.47619	10.04209	-31.72633	-31.70777
96.000	-33.07144	-75.13787	8.67842	-33.38801	-33.07146
96.250	-36.34517	-77.00163	5.40469	-35.25177	-36.34509
96.500	-40.78025	-79.04003	.96961	-37.29017	-40.77989
96.750	-38.62586	-80.94963	3.12400	-39.19977	-38.62590
97.000	-34.59692	-82.07223	7.15294	-40.32237	-34.59713
97.250	-32.35752	-82.07679	9.39234	-40.32694	-32.35776
97.500	-31.49669	-81.52967	10.25317	-39.77981	-31.49694
97.750	-31.74948	-81.06927	10.00038	-39.31941	-31.74972
98.000	-33.09152	-80.93843	8.65834	-39.18857	-33.09174
98.250	-35.75178	-81.10319	5.77808	-39.35333	-35.75194
98.500	-40.43790	-81.33793	1.31196	-39.58807	-40.43783
98.750	-47.30067	-81.29115	-5.55081	-39.54129	-47.29923
99.000	-43.40427	-80.73558	-1.65441	-38.98572	-43.40375
99.250	-39.13009	-79.81048	2.61977	-38.06062	-39.13001
99.500	-37.25693	-78.84905	4.49293	-37.09919	-37.25672
99.750	-36.89792	-78.10820	4.85194	-36.35834	-36.89788
100.000	-37.77013	-77.72396	3.97973	-35.97410	-37.76998
100.250	-39.93195	-77.76947	1.81790	-36.01961	-39.93153
100.500	-43.80077	-78.30729	-2.05091	-36.55743	-43.79952
100.750	-49.79505	-79.42865	-8.04519	-37.67879	-49.79062
101.000	-49.77245	-81.30437	-8.02259	-39.55451	-49.76969
101.250	-45.62492	-84.30948	-3.87506	-42.55962	-45.62463
101.500	-43.81027	-89.51009	-2.06041	-47.76023	-43.81045
101.750	-43.87207	-101.85169	-2.12221	-60.10183	-43.87236
102.000	-45.77708	-93.27887	-4.02722	-51.52901	-45.77729

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(4.0866959E+00)= 12.2274464

20LOG(MAX(FIELD-Y))=20LOG(3.3410220E-02)= -29.5224134

Appendix C2. Random Error Analysis.

Random error in 1st decimal position.

Angle	Original	With Error	Difference
-12.000	-49.06787	-12.03903	-37.02884
-11.750	-43.93221	-10.30268	-33.62953
-11.500	-41.33900	-8.87859	-32.46041
-11.250	-40.33307	-7.69191	-32.64116
-11.000	-40.68493	-6.69311	-33.99182
-10.750	-42.61434	-5.84777	-36.76657
-10.500	-47.10811	-5.13089	-41.97722
-10.250	-53.64291	-4.52349	-49.11942
-10.000	-46.00166	-4.01055	-41.99111
-9.750	-41.14452	-3.57964	-37.56488
-9.500	-38.73701	-3.22007	-35.51694
-9.250	-37.88040	-2.92221	-34.95819
-9.000	-38.39668	-2.67707	-35.71961
-8.750	-40.56754	-2.47602	-38.09152
-8.500	-45.47711	-2.31060	-43.16651
-8.250	-49.84367	-2.17248	-47.67119
-8.000	-42.41628	-2.05352	-40.36276
-7.750	-38.16783	-1.94595	-36.22188
-7.500	-36.14669	-1.84271	-34.30398
-7.250	-35.69943	-1.73770	-33.96173
-7.000	-36.83588	-1.62625	-35.20963
-6.750	-40.26575	-1.50532	-38.76043
-6.500	-47.40619	-1.37369	-46.03250
-6.250	-41.55255	-1.23193	-40.32062
-6.000	-35.56941	-1.08217	-34.48724
-5.750	-32.46044	-.92777	-31.53267
-5.500	-31.03185	-.77288	-30.25897
-5.250	-30.99347	-.62204	-30.37143
-5.000	-32.53197	-.47974	-32.05223
-4.750	-36.57835	-.35021	-36.22814
-4.500	-43.46897	-.23714	-43.23183
-4.250	-36.00834	-.14358	-35.86476
-4.000	-30.95331	-.07189	-30.88142
-3.750	-28.75972	-.02371	-28.73601
-3.500	-28.79469	0.00000	-28.79469
-3.250	-31.77433	-.00104	-31.77329
-3.000	-33.20416	-.02649	-33.17767
-2.750	-24.10945	-.07543	-24.03402
-2.500	-17.86255	-.14641	-17.71614
-2.250	-13.44063	-.23748	-13.20315
-2.000	-10.06742	-.34630	-9.72112
-1.750	-7.40317	-.47015	-6.93302
-1.500	-5.27293	-.60611	-4.66682
-1.250	-3.57543	-.75108	-2.82435
-1.000	-2.24751	-.90202	-1.34549
-.750	-1.24817	-1.05603	-.19214
-.500	-.55053	-1.21053	.66000
-.250	-.13762	-1.36343	1.22581
0.000	0.00000	-1.51324	1.51324

1st position. Continued.

Angle	Original	With Error	Difference
.250	-.13468	-.14590	.01122
.500	-.54471	-.28776	-.25695
.750	-1.23958	-.42614	-.81344
1.000	-2.23636	-.56216	-1.67420
1.250	-3.56207	-.69734	-2.86473
1.500	-5.25799	-.83352	-4.42447
1.750	-7.38778	-.97260	-6.41518
2.000	-10.05372	-1.11640	-8.93732
2.250	-13.43301	-1.26649	-12.16652
2.500	-17.87113	-1.42407	-16.44706
2.750	-24.16085	-1.58984	-22.57101
3.000	-33.23618	-1.76387	-31.47231
3.250	-31.46467	-1.94558	-29.51909
3.500	-28.53683	-2.13361	-26.40322
3.750	-28.50434	-2.32581	-26.17853
4.000	-30.65907	-2.51923	-28.13984
4.250	-35.59481	-2.71010	-32.88471
4.500	-43.16345	-2.89393	-40.26952
4.750	-36.59534	-3.06567	-33.52967
5.000	-32.45108	-3.21992	-29.23116
5.250	-30.84334	-3.35126	-27.49208
5.500	-30.81273	-3.45468	-27.35805
5.750	-32.14957	-3.52602	-28.62355
6.000	-35.10124	-3.56235	-31.53889
6.250	-40.73369	-3.56239	-37.17130
6.500	-47.76891	-3.52657	-44.24234
6.750	-40.77157	-3.45704	-37.31453
7.000	-37.05727	-3.35747	-33.69980
7.250	-35.76181	-3.23264	-32.52917
7.500	-36.07534	-3.08805	-32.98729
7.750	-37.93148	-2.92951	-35.00197
8.000	-41.88952	-2.76278	-39.12674
8.250	-49.24470	-2.59330	-46.65140
8.500	-46.47947	-2.42602	-44.05345
8.750	-41.15507	-2.26535	-38.88972
9.000	-38.77481	-2.11509	-36.65972
9.250	-38.12335	-1.97849	-36.14486
9.500	-38.85774	-1.85827	-36.99947
9.750	-41.10932	-1.75669	-39.35263
10.000	-45.69105	-1.67560	-44.01545
10.250	-54.04289	-1.61653	-52.42636
10.500	-48.32380	-1.58070	-46.74310
10.750	-43.38934	-1.56910	-41.82024
11.000	-41.27979	-1.58248	-39.69731
11.250	-40.82312	-1.62142	-39.20170
11.500	-41.74335	-1.68632	-40.05703
11.750	-44.23155	-1.77740	-42.45415
12.000	-49.18177	-1.89472	-47.28705

ORIGINAL PAGE IS
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1st position. Continued.

Angle	Original	With Error	Difference
78.000	-52.77973	-5.70354	-47.07619
78.250	-45.82849	-7.18477	-38.64372
78.500	-42.68191	-8.95741	-33.72450
78.750	-41.30746	-10.51697	-30.79049
79.000	-41.25922	-10.68504	-30.57418
79.250	-42.53174	-9.14009	-33.39165
79.500	-45.36380	-7.03725	-38.32655
79.750	-48.86234	-5.12321	-43.73913
80.000	-46.82183	-3.56380	-43.25803
80.250	-42.93696	-2.34571	-40.59125
80.500	-40.67060	-1.42492	-39.24568
80.750	-39.92691	-.76032	-39.16659
81.000	-40.70725	-.31857	-40.38868
81.250	-43.61652	-.07275	-43.54377
81.500	-51.95433	0.00000	-51.95433
81.750	-50.87528	-.07934	-50.79594
82.000	-41.83057	-.28973	-41.54084
82.250	-37.92088	-.60849	-37.31239
82.500	-36.05490	-1.01024	-35.04466
82.750	-35.63012	-1.46673	-34.16339
83.000	-36.63914	-1.94806	-34.69108
83.250	-39.56826	-2.42537	-37.14289
83.500	-45.03783	-2.87433	-42.16350
83.750	-42.38740	-3.27767	-39.10973
84.000	-36.71101	-3.62511	-33.08590
84.250	-33.61598	-3.90999	-29.70599
84.500	-32.25862	-4.12460	-28.13402
84.750	-32.39854	-4.25728	-28.14126
85.000	-34.34103	-4.29412	-30.04691
85.250	-39.44165	-4.22564	-35.21601
85.500	-42.97776	-4.05501	-38.92275
85.750	-34.55257	-3.80227	-30.75030
86.000	-30.28756	-3.50143	-26.78613
86.250	-28.49775	-3.19230	-25.30545
86.500	-28.91539	-2.91182	-26.00357
86.750	-33.07045	-2.68819	-30.38226
87.000	-36.42609	-2.53782	-33.88827
87.250	-24.34926	-2.46402	-21.88524
87.500	-17.86758	-2.45602	-15.41156
87.750	-13.41291	-2.48835	-10.92456
88.000	-10.03936	-2.52193	-7.51743
88.250	-7.38128	-2.50969	-4.87159
88.500	-5.25780	-2.40875	-2.84705
88.750	-3.56608	-2.19633	-1.36975
89.000	-2.24260	-1.88040	-.36220
89.250	-1.24635	-1.49710	.25075
89.500	-.55051	-1.09734	.54683
89.750	-.13819	-.73225	.59406
90.000	0.00000	-.44465	.44465

ORIGINAL PAGE IS
OF POOR QUALITY

1st position. Concluded.

Angle	Original	With Error	Difference
90.250	-.13293	-.04504	-.08789
90.500	-.53996	0.00000	-.53996
90.750	-1.23046	-.10423	-1.12623
91.000	-2.22127	-.36978	-1.85149
91.250	-3.53910	-.80583	-2.73327
91.500	-5.22483	-1.41938	-3.80545
91.750	-7.34165	-2.21485	-5.12680
92.000	-9.99171	-3.19225	-6.79946
92.250	-13.35415	-4.34311	-9.01104
92.500	-17.78911	-5.64288	-12.14623
92.750	-24.21448	-7.03904	-17.17544
93.000	-35.78751	-8.43770	-27.34981
93.250	-32.95145	-9.70091	-23.25054
93.500	-28.87068	-10.67506	-18.19562
93.750	-28.45051	-11.24611	-17.20440
94.000	-30.22144	-11.36764	-18.85380
94.250	-34.42095	-11.03750	-23.38345
94.500	-42.48175	-10.28565	-32.19610
94.750	-39.45100	-9.19809	-30.25291
95.000	-34.45498	-7.91441	-26.54057
95.250	-32.56272	-6.58023	-25.98249
95.500	-32.50140	-5.30610	-27.19530
95.750	-34.00464	-4.15916	-29.84548
96.000	-37.41813	-3.17350	-34.24463
96.250	-43.87010	-2.36292	-41.50718
96.500	-44.50106	-1.73020	-42.77086
96.750	-38.75205	-1.27259	-37.47946
97.000	-36.03050	-.98480	-35.04570
97.250	-35.16774	-.86051	-34.30723
97.500	-35.72145	-.89293	-34.82852
97.750	-37.75337	-1.07505	-36.67832
98.000	-42.00341	-1.39937	-40.60404
98.250	-52.71455	-1.85748	-50.85707
98.500	-49.47283	-2.43907	-47.03376
98.750	-42.25986	-3.13021	-39.12965
99.000	-39.62025	-3.91002	-35.71023
99.250	-38.96488	-4.74478	-34.22010
99.500	-39.82124	-5.57887	-34.24237
99.750	-42.36124	-6.32517	-36.03607
100.000	-47.65110	-6.86667	-40.78443
100.250	-54.64113	-7.08914	-47.55199
100.500	-46.94927	-6.94325	-40.00602
100.750	-42.77330	-6.48154	-36.29176
101.000	-41.00091	-5.82468	-35.17623
101.250	-40.74367	-5.09740	-35.64627
101.500	-41.82066	-4.39196	-37.42870
101.750	-44.50357	-3.76453	-40.73904
102.000	-50.09615	-3.24456	-46.85159

ORIGINAL PAGE IS
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Random error in 2nd decimal position.

Angle	Original	With Error	Difference
-12.000	-49.06787	-29.84882	-19.21905
-11.750	-43.93221	-30.63082	-13.30139
-11.500	-41.33900	-31.03826	-10.30074
-11.250	-40.33307	-31.07873	-9.25434
-11.000	-40.68493	-30.88244	-9.80249
-10.750	-42.61434	-30.59936	-12.01498
-10.500	-47.10811	-30.34491	-16.76320
-10.250	-53.64291	-30.20477	-23.43814
-10.000	-46.00166	-30.25196	-15.74970
-9.750	-41.14452	-30.55258	-10.59194
-9.500	-38.73701	-31.15549	-7.58152
-9.250	-37.88040	-32.05622	-5.82418
-9.000	-38.39668	-33.10690	-5.28978
-8.750	-40.56754	-33.89081	-6.67673
-8.500	-45.47711	-33.89602	-11.58109
-8.250	-49.84367	-33.18032	-16.66335
-8.000	-42.41628	-32.34202	-10.07426
-7.750	-38.16783	-31.87231	-6.29552
-7.500	-36.14669	-32.02741	-4.11928
-7.250	-35.69943	-32.96463	-2.73480
-7.000	-36.83588	-34.77405	-2.06183
-6.750	-40.26575	-37.01107	-3.25468
-6.500	-47.40619	-37.31239	-10.09380
-6.250	-41.55255	-34.98256	-6.56999
-6.000	-35.56941	-32.73236	-2.83705
-5.750	-32.46044	-31.50964	-.95080
-5.500	-31.03185	-31.44528	.41343
-5.250	-30.99347	-32.70989	1.71642
-5.000	-32.53197	-35.60318	3.07121
-4.750	-36.57835	-38.15126	1.57291
-4.500	-43.46897	-34.38303	-9.08594
-4.250	-36.00834	-30.39198	-5.61636
-4.000	-30.95331	-28.19259	-2.76072
-3.750	-28.75972	-27.69679	-1.06293
-3.500	-28.79469	-29.26620	.47151
-3.250	-31.77433	-32.90314	1.12881
-3.000	-33.20416	-27.56125	-5.64291
-2.750	-24.10945	-20.46517	-3.64428
-2.500	-17.86255	-15.49335	-2.36920
-2.250	-13.44063	-11.76481	-1.67582
-2.000	-10.06742	-8.83628	-1.23114
-1.750	-7.40317	-6.48671	-.91646
-1.500	-5.27293	-4.59242	-.68051
-1.250	-3.57543	-3.07806	-.49737
-1.000	-2.24751	-1.89535	-.35216
-.750	-1.24817	-1.01262	-.23555
-.500	-.55053	-.40944	-.14109
-.250	-.13762	-.07367	-.06395
0.000	0.00000	0.00000	0.00000

2nd position. Continued.

Angle	Original	With Error	Difference
0.000	0.00000	0.00000	0.00000
.250	-.13468	-.18934	.05466
.500	-.54471	-.64909	.10438
.750	-1.23958	-1.39421	.15463
1.000	-2.23636	-2.44958	.21322
1.250	-3.56207	-3.85447	.29240
1.500	-5.25799	-5.67102	.41303
1.750	-7.38778	-8.00180	.61402
2.000	-10.05372	-11.02938	.97566
2.250	-13.43301	-15.11811	1.68510
2.500	-17.87113	-21.07419	3.20306
2.750	-24.16085	-28.06069	3.89984
3.000	-33.23618	-24.21448	-9.02170
3.250	-31.46467	-20.89177	-10.57290
3.500	-28.53683	-19.60978	-8.92705
3.750	-28.50434	-19.59017	-8.91417
4.000	-30.65907	-20.54170	-10.11737
4.250	-35.59481	-22.41539	-13.17942
4.500	-43.16345	-25.35339	-17.81006
4 750	-36.59534	-29.81066	-6.78468
5.000	-32.45108	-37.05675	4.60567
5.250	-30.84334	-43.06674	12.22340
5.500	-30.81273	-37.61512	6.80239
5.750	-32.14957	-35.82630	3.67673
6.000	-35.10124	-36.68008	1.57884
6.250	-40.73369	-40.21176	-.52193
6.500	-47.76891	-48.37058	.60167
6.750	-40.77157	-44.58852	3.81695
7.000	-37.05727	-38.82285	1.76558
7.250	-35.76181	-36.53322	.77141
7.500	-36.07534	-36.29263	.21729
7.750	-37.93148	-37.96113	.02965
8.000	-41.88952	-41.84347	-.04605
8.250	-49.24470	-42.03481	-7.20989
8.500	-46.47947	-36.09027	-10.38920
8.750	-41.15507	-31.93663	-9.21844
9.000	-38.77481	-29.28113	-9.49368
9.250	-38.12335	-27.61296	-10.51039
9.500	-38.85774	-26.67663	-12.18111
9.750	-41.10932	-26.34039	-14.76893
10.000	-45.69105	-26.53572	-19.15533
10.250	-54.04289	-27.23127	-26.81162
10.500	-48.32380	-28.42013	-19.90367
10.750	-43.38934	-30.11049	-13.27885
11.000	-41.27979	-32.30635	-8.97344
11.250	-40.82312	-34.93710	-5.88602
11.500	-41.74335	-37.60427	-4.13908
11.750	-44.23155	-39.15541	-5.07614
12.000	-49.18177	-38.67184	-10.50993

2nd position. Continued.

Angle	Original	With Error	Difference
78.000	-52.77973	-36.38637	-16.39336
78.250	-45.82849	-35.78891	-10.03958
78.500	-42.68191	-35.00032	-7.68159
78.750	-41.30746	-34.27289	-7.03457
79.000	-41.25922	-33.66202	-7.59720
79.250	-42.53174	-33.07978	-9.45196
79.500	-45.36380	-32.39937	-12.96443
79.750	-48.86234	-31.57225	-17.29009
80.000	-46.82183	-30.67757	-16.14426
80.250	-42.93696	-29.86217	-13.07479
80.500	-40.67060	-29.25869	-11.41191
80.750	-39.92691	-28.95324	-10.97367
81.000	-40.70725	-28.98848	-11.71877
81.250	-43.61652	-29.37000	-14.24652
81.500	-51.95433	-30.05949	-21.89484
81.750	-50.87528	-30.94938	-19.92590
82.000	-41.83057	-31.83295	-9.99762
82.250	-37.92088	-32.43263	-5.48825
82.500	-36.05490	-32.54444	-3.51046
82.750	-35.63012	-32.14971	-3.48041
83.000	-36.63914	-31.32580	-5.31334
83.250	-39.56826	-30.15265	-9.41561
83.500	-45.03783	-28.74881	-16.28902
83.750	-42.38740	-27.28434	-15.10306
84.000	-36.71101	-25.91472	-10.79629
84.250	-33.61598	-24.72569	-8.89029
84.500	-32.25862	-23.72296	-8.53566
84.750	-32.39854	-22.84505	-9.55349
85.000	-34.34103	-21.99324	-12.34779
85.250	-39.44165	-21.08812	-18.35353
85.500	-42.97776	-20.13249	-22.84527
85.750	-34.55257	-19.22584	-15.32673
86.000	-30.28756	-18.52277	-11.76479
86.250	-28.49775	-18.19157	-10.30618
86.500	-28.91539	-18.40989	-10.50550
86.750	-33.07045	-19.37734	-13.69311
87.000	-36.42609	-21.16122	-15.26487
87.250	-24.34926	-22.20097	-2.14829
87.500	-17.86758	-19.09009	1.22251
87.750	-13.41291	-14.66517	1.25226
88.000	-10.03936	-10.99222	.95286
88.250	-7.38128	-8.09708	.71580
88.500	-5.25780	-5.80507	.54727
88.750	-3.56608	-3.98919	.42311
89.000	-2.24260	-2.56742	.32482
89.250	-1.24635	-1.48660	.24025
89.500	-.55051	-.71197	.16146
89.750	-.13819	-.22100	.08281
90.000	0.00000	0.00000	0.00000

ORIGINAL PAGE IS OF POOR QUALITY

2nd position. Concluded.

Angle	Original	With Error	Difference
90.000	0.00000	0.00000	0.00000
90.250	-.13293	-.04213	-.09080
90.500	-.53996	-.34648	-.19348
90.750	-1.23046	-.91781	-.31265
91.000	-2.22127	-1.76694	-.45433
91.250	-3.53910	-2.91185	-.62725
91.500	-5.22483	-4.37967	-.84516
91.750	-7.34165	-6.21032	-1.13133
92.000	-9.99171	-8.46234	-1.52937
92.250	-13.35415	-11.22253	-2.13162
92.500	-17.78911	-14.61754	-3.17157
92.750	-24.21448	-18.79421	-5.42027
93.000	-35.78751	-23.56458	-12.22293
93.250	-32.95145	-26.64276	-6.30869
93.500	-28.87068	-26.09868	-2.77200
93.750	-28.45051	-24.97253	-3.47798
94.000	-30.22144	-24.32464	-5.89680
94.250	-34.42095	-23.91362	-10.50733
94.500	-42.48175	-23.48472	-18.99703
94.750	-39.45100	-23.02700	-16.42400
95.000	-34.45498	-22.69618	-11.75880
95.250	-32.56272	-22.65317	-9.90955
95.500	-32.50140	-22.99456	-9.50684
95.750	-34.00464	-23.74895	-10.25569
96.000	-37.41813	-24.86298	-12.55515
96.250	-43.87010	-26.13519	-17.73491
96.500	-44.50106	-27.14739	-17.35367
96.750	-38.75205	-27.48001	-11.27204
97.000	-36.03050	-27.20733	-8.82317
97.250	-35.16774	-26.79059	-8.37715
97.500	-35.72145	-26.58709	-9.13436
97.750	-37.75337	-26.74023	-11.01314
98.000	-42.00341	-27.26089	-14.74252
98.250	-52.71455	-28.07330	-24.64125
98.500	-49.47283	-29.01417	-20.45866
98.750	-42.25986	-29.84563	-12.41423
99.000	-39.62025	-30.36668	-9.25357
99.250	-38.96488	-30.57176	-8.39312
99.500	-39.82124	-30.63168	-9.18956
99.750	-42.36124	-30.71911	-11.64213
100.000	-47.65110	-30.90346	-16.74764
100.250	-54.64113	-31.15251	-23.48862
100.500	-46.94927	-31.38271	-15.56656
100.750	-42.77330	-31.53115	-11.24215
101.000	-41.00091	-31.61285	-9.38806
101.250	-40.74367	-31.71704	-9.02663
101.500	-41.82066	-31.95612	-9.86454
101.750	-44.55357	-32.42233	-12.08124
102.000	-50.09615	-33.17339	-16.92276

Random error in 3rd decimal positon.

Angle	Original	With Error	Difference
-12.000	-49.06787	-48.53456	-.53331
-11.750	-43.93221	-43.57508	-.35713
-11.500	-41.33900	-41.10801	-.23099
-11.250	-40.33307	-40.21239	-.12068
-11.000	-40.68493	-40.66575	-.01918
-10.750	-42.61434	-42.67728	.06294
-10.500	-47.10811	-47.07447	-.03364
-10.250	-53.64291	-51.80163	-1.84128
-10.000	-46.00166	-45.50580	-.49586
-9.750	-41.14452	-41.15064	.00612
-9.500	-38.73701	-38.98897	.25196
-9.250	-37.88040	-38.34306	.46266
-9.000	-38.39668	-39.11002	.71334
-8.750	-40.56754	-41.66149	1.09395
-8.500	-45.47711	-47.07499	1.59788
-8.250	-49.84367	-47.83787	-2.00580
-8.000	-42.41628	-41.28848	-1.12780
-7.750	-38.16783	-37.70981	-.45802
-7.500	-36.14669	-36.06881	-.07788
-7.250	-35.69943	-35.94103	.24160
-7.000	-36.83588	-37.47076	.63488
-6.750	-40.26575	-41.60895	1.34320
-6.500	-47.40619	-47.59769	.17150
-6.250	-41.55255	-39.66721	-1.88534
-6.000	-35.56941	-34.51572	-1.05369
-5.750	-32.46044	-31.77386	-.68658
-5.500	-31.03185	-30.55005	-.48180
-5.250	-30.99347	-30.64477	-.34870
-5.000	-32.53197	-32.27517	-.25680
-4.750	-36.57835	-36.37543	-.20292
-4.500	-43.46897	-43.39540	-.07357
-4.250	-36.00834	-36.12214	.11380
-4.000	-30.95331	-31.12534	.17203
-3.750	-28.75972	-29.03770	.27798
-3.500	-28.79469	-29.26441	.46972
-3.250	-31.77433	-32.60886	.83453
-3.000	-33.20416	-32.46690	-.73726
-2.750	-24.10945	-23.48725	-.62220
-2.500	-17.86255	-17.48532	-.37723
-2.250	-13.44063	-13.18717	-.25346
-2.000	-10.06742	-9.88781	-.17961
-1.750	-7.40317	-7.27303	-.13014
-1.500	-5.27293	-5.17840	-.09453
-1.250	-3.57543	-3.50771	-.06772
-1.000	-2.24751	-2.20053	-.04698
-.750	-1.24817	-1.21746	-.03071
-.500	-.55053	-.53265	-.01788
-.250	-.13762	-.12981	-.00781
0.000	0.00000	0.00000	0.00000

3rd position. Continued.

Angle	Original	With Error	Difference
0.000	0.00000	0.00000	0.00000
.250	-.13468	-.14061	.00593
.500	-.54471	-.55502	.01031
.750	-1.23958	-1.25306	.01348
1.000	-2.23636	-2.25220	.01584
1.250	-3.58207	-3.58002	.01795
1.500	-5.25799	-5.27870	.02071
1.750	-7.38778	-7.41352	.02574
2.000	-10.05372	-10.09000	.03628
2.250	-13.43301	-13.49262	.05961
2.500	-17.87113	-17.98582	.11469
2.750	-24.16085	-24.41716	.25631
3.000	-33.23618	-33.34327	.10709
3.250	-31.46467	-30.56507	-.89960
3.500	-28.53683	-27.77253	-.76430
3.750	-28.50434	-27.70504	-.79930
4.000	-30.65907	-29.66124	-.99783
4.250	-35.59481	-34.07565	-1.51916
4.500	-43.16345	-42.34774	-.81571
4.750	-36.59534	-37.99545	1.40011
5.000	-32.45108	-33.13432	.68324
5.250	-30.84334	-31.20854	.36520
5.500	-30.81273	-30.98841	.17568
5.750	-32.14957	-32.17509	.02552
6.000	-35.10124	-34.96468	-.13656
6.250	-40.73369	-40.34021	-.39348
6.500	-47.76891	-47.94536	.17645
6.750	-40.77157	-41.14786	.37629
7.000	-37.05727	-37.20331	.14604
7.250	-35.76181	-35.78051	.01870
7.500	-36.07534	-36.00277	-.07257
7.750	-37.93148	-37.78297	-.14851
8.000	-41.88952	-41.65967	-.22985
8.250	-49.24470	-48.56704	-.67766
8.500	-46.47947	-45.47625	-1.00322
8.750	-41.15507	-40.29341	-.86166
9.000	-38.77481	-37.83648	-.93833
9.250	-38.12335	-37.01400	-1.10935
9.500	-38.85774	-37.47223	-1.38551
9.750	-41.10932	-39.25226	-1.85706
10.000	-45.69105	-42.85633	-2.83472
10.250	-54.04289	-49.88509	-4.15780
10.500	-48.32380	-50.83367	2.50987
10.750	-43.38934	-44.31677	.92743
11.000	-41.27979	-41.35242	.07263
11.250	-40.82312	-40.27625	-.54687
11.500	-41.74335	-40.54946	-1.19389
11.750	-44.23155	-42.12043	-2.11112
12.000	-49.18177	-45.34681	-3.83496

3rd position. Continued.

Angle	Original	With Error	Difference
78.000	-52.77973	-61.74283	8.96310
78.250	-45.82849	-49.03953	3.21104
78.500	-42.68191	-45.00121	2.31930
78.750	-41.30746	-43.51497	2.20751
79.000	-41.25922	-43.82079	2.56157
79.250	-42.53174	-46.17777	3.64603
79.500	-45.36380	-52.17482	6.81102
79.750	-48.86234	-52.39182	3.52948
80.000	-46.82183	-44.63247	-2.18936
80.250	-42.93696	-40.62866	-2.30830
80.500	-40.67060	-38.54428	-2.12632
80.750	-39.92691	-37.79110	-2.13581
81.000	-40.70725	-38.26359	-2.44366
81.250	-43.61652	-40.19887	-3.41765
81.500	-51.95433	-44.46256	-7.49177
81.750	-50.87528	-51.25220	.37692
82.000	-41.83057	-44.97942	3.14885
82.250	-37.92088	-40.14174	2.22086
82.500	-36.05490	-37.93397	1.87907
82.750	-35.63012	-37.50804	1.87792
83.000	-36.63914	-38.90820	2.26906
83.250	-39.56826	-43.38735	3.81909
83.500	-45.03783	-63.02871	17.99088
83.750	-42.38740	-42.13133	-.25607
84.000	-36.71101	-36.16973	-.54128
84.250	-33.61598	-33.25675	-.35923
84.500	-32.25862	-32.02108	-.23754
84.750	-32.39854	-32.19073	-.20781
85.000	-34.34103	-33.88342	-.45761
85.250	-39.44165	-36.90964	-2.53201
85.500	-42.97776	-36.29809	-6.67967
85.750	-34.55257	-31.77359	-2.77898
86.000	-30.28756	-28.58129	-1.70627
86.250	-28.49775	-27.07703	-1.42072
86.500	-28.91539	-27.36258	-1.55281
86.750	-33.07045	-30.39491	-2.67554
87.000	-36.42609	-34.52876	-1.89733
87.250	-24.34926	-24.76606	.41680
87.500	-17.86758	-18.12493	.25735
87.750	-13.41291	-13.57236	.15945
88.000	-10.03936	-10.14506	.10570
88.250	-7.38128	-7.45518	.07390
88.500	-5.25780	-5.31141	.05361
88.750	-3.56608	-3.60575	.03967
89.000	-2.24260	-2.27196	.02936
89.250	-1.24635	-1.26741	.02106
89.500	-.55051	-.56434	.01383
89.750	-.13819	-.14516	.00697
90.000	0.00000	0.00000	0.00000

ORIGINAL PAGE IS
OF POOR QUALITY

3rd position. Concluded.

Angle	Original	With Error	Difference
90.000	0.00000	0.00000	0.00000
90.250	-.13293	-.12542	-.00751
90.500	-.53996	-.52400	-.01596
90.750	-1.23046	-1.20460	-.02586
91.000	-2.22127	-2.18346	-.03781
91.250	-3.53910	-3.48643	-.05267
91.500	-5.22483	-5.15297	-.07186
91.750	-7.34165	-7.24396	-.09769
92.000	-9.99171	-9.85723	-.13448
92.250	-13.35415	-13.16306	-.19109
92.500	-17.78911	-17.50081	-.28830
92.750	-24.21448	-23.73590	-.47858
93.000	-35.78751	-35.77225	-.01526
93.250	-32.95145	-35.33822	2.38677
93.500	-28.87068	-29.88803	1.01735
93.750	-28.45051	-29.24673	.79622
94.000	-30.22144	-31.10217	.88073
94.250	-34.42095	-35.95949	1.53854
94.500	-42.48175	-52.90207	10.42032
94.750	-37.45100	-39.69466	.24366
95.000	-34.45498	-34.11596	-.33902
95.250	-32.56272	-32.15668	-.40604
95.500	-32.50140	-32.00631	-.49509
95.750	-34.00464	-33.30451	-.70013
96.000	-37.41813	-36.12943	-1.28870
96.250	-43.87010	-40.25451	-3.61559
96.500	-44.50106	-40.76833	-3.73273
96.750	-38.75205	-37.33717	-1.41488
97.000	-36.03050	-35.08050	-.95000
97.250	-35.16774	-34.25089	-.91685
97.500	-35.72145	-34.64108	-1.08037
97.750	-37.75337	-36.27002	-1.48335
98.000	-42.00341	-39.50221	-2.50120
98.250	-52.71455	-45.53470	-7.17985
98.500	-49.47283	-51.23069	1.75786
98.750	-42.25986	-44.37302	2.11316
99.000	-39.62025	-41.05775	1.43750
99.250	-38.96488	-40.02228	1.05740
99.500	-39.82124	-40.56503	.74379
99.750	-42.36124	-42.55905	.19781
100.000	-47.65110	-45.69383	-1.95727
100.250	-54.64113	-46.61453	-8.02660
100.500	-46.94927	-43.65893	-3.29034
100.750	-42.77330	-41.13446	-1.63884
101.000	-41.00091	-39.87639	-1.12452
101.250	-40.74367	-39.76394	-.97973
101.500	-41.82066	-40.77453	-1.04613
101.750	-44.50357	-43.12459	-1.37898
102.000	-50.09615	-47.58158	-2.51457

APPENDIX D

DISTORTED REFLECTOR

ORIGINAL PAGE IS
OF POOR QUALITY

Appedix D1. Pattern output data.
Distribution C200.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-24.67177	-34.70398	-3.56529	-13.59750	-24.27670
-11.750	-22.26768	-33.75373	-1.16120	-12.64726	-21.98563
-11.500	-19.31439	-33.16705	1.79208	-12.06057	-19.15505
-11.250	-16.68850	-32.92439	4.41797	-11.81792	-16.60233
-11.000	-14.57210	-32.97260	6.53437	-11.86612	-14.52572
-10.750	-12.95070	-33.20613	8.15577	-12.09965	-12.92588
-10.500	-11.77814	-33.44877	9.32834	-12.34229	-11.76461
-10.250	-11.01120	-33.48340	10.09528	-12.37692	-11.00262
-10.000	-10.61354	-33.17149	10.49293	-12.06501	-10.60545
-9.750	-10.55208	-32.55759	10.55439	-11.45111	-10.54074
-9.500	-10.78870	-31.80475	10.31778	-10.69827	-10.77040
-9.250	-11.26344	-31.05603	9.84303	-9.94956	-11.23406
-9.000	-11.86057	-30.37689	9.24590	-9.27041	-11.81582
-8.750	-12.35678	-29.77091	8.74969	-8.66443	-12.29465
-8.500	-12.41543	-29.21478	8.69104	-8.10830	-12.34155
-8.250	-11.77591	-28.68766	9.33056	-7.58118	-11.70431
-8.000	-10.51688	-28.18586	10.58960	-7.07938	-10.45916
-7.750	-8.95877	-27.71999	12.14771	-6.61351	-8.91732
-7.500	-7.38191	-27.30019	13.72456	-6.19371	-7.35382
-7.250	-5.93976	-26.91994	15.16672	-5.81347	-5.92118
-7.000	-4.70009	-26.54769	16.40638	-5.44121	-4.68774
-6.750	-3.68935	-26.13227	17.41712	-5.02579	-3.68061
-6.500	-2.91572	-25.62449	18.19076	-4.51802	-2.90844
-6.250	-2.37869	-25.00561	18.72778	-3.89914	-2.37097
-6.000	-2.07187	-24.30169	19.03460	-3.19521	-2.06190
-5.750	-1.98197	-23.57163	19.12450	-2.46516	-1.96790
-5.500	-2.08446	-22.88184	19.02201	-1.77537	-2.06440
-5.250	-2.33555	-22.28721	18.77093	-1.18074	-2.30779
-5.000	-2.66146	-21.82512	18.44502	-.71865	-2.62506
-4.750	-2.95237	-21.51774	18.15411	-.41126	-2.90829
-4.500	-3.07900	-21.37678	18.02748	-.27031	-3.03114
-4.250	-2.94619	-21.40758	18.16028	-.30111	-2.90067
-4.000	-2.55148	-21.61088	18.55499	-.50441	-2.51382
-3.750	-1.98413	-21.98125	19.12234	-.87478	-1.95683
-3.500	-1.36628	-22.50029	19.74019	-1.39381	-1.34890
-3.250	-.80122	-23.12178	20.30526	-2.01530	-.79177
-3.000	-.35861	-23.74879	20.74787	-2.64232	-.35469
-2.750	-.08190	-24.21884	21.02458	-3.11237	-.08111
-2.500	0.00000	-24.34603	21.10648	-3.23955	0.00000
-2.250	-.13650	-24.04529	20.96997	-2.93882	-.13482
-2.000	-.51554	-23.41525	20.59094	-2.30878	-.50925
-1.750	-1.16442	-22.65783	19.94205	-1.55136	-1.14968
-1.500	-2.11091	-21.95359	18.99556	-.84711	-2.08205
-1.250	-3.36459	-21.41885	17.74188	-.31237	-3.31308
-1.000	-4.84774	-21.12148	16.25874	-.01501	-4.76243
-.750	-6.20747	-21.10648	14.87700	0.00000	-6.08507
-.500	-6.66983	-21.41583	14.43665	-.30935	-6.54255
-.250	-5.79615	-22.10467	15.31032	-.99820	-5.71165
0.000	-4.22002	-23.26091	16.88645	-2.15444	-4.18213

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(2.7929305E-01)= -11.0787976

20LOG(MAX(FIELD-Y))=20LOG(2.4588744E-02)= -32.1852731

ORIGINAL PAGE IS
OF POOR QUALITY

C200. Concluded.

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	-4.45662	-23.49751	19.04089	0.00000	-4.40348
.250	-2.89499	-25.27931	20.60252	-1.78180	-2.87067
.500	-1.63353	-28.01289	21.86396	-4.51538	-1.62425
.750	-.73419	-32.54098	22.76332	-9.04347	-.73201
1.000	-.19417	-41.86110	23.30334	-18.36359	-.19456
1.250	0.00000	-38.03523	23.49751	-14.53772	0.00000
1.500	-.14153	-31.22744	23.35598	-7.72993	-.13883
1.750	-.61352	-27.79544	22.88399	-4.29792	-.60590
2.000	-1.41129	-25.81504	22.08622	-2.31753	-1.39625
2.250	-2.51846	-24.71455	20.97905	-1.21704	-2.49303
2.500	-3.87723	-24.26931	19.62029	-.77180	-3.83841
2.750	-5.32843	-24.38707	18.16908	-.88956	-5.27551
3.000	-6.54982	-25.04711	16.94769	-1.54960	-6.48955
3.250	-7.17092	-26.28729	16.32459	-2.78978	-7.11870
3.500	-7.14524	-28.22213	16.35227	-4.72462	-7.11216
3.750	-6.81343	-31.11722	16.68408	-7.61971	-6.79802
4.000	-6.53487	-35.66970	16.96264	-12.17219	-6.53025
4.250	-6.50646	-44.77855	16.99105	-21.28104	-6.50649
4.500	-6.80761	-47.53481	16.68990	-24.03730	-6.80793
4.750	-7.46624	-38.66813	16.03128	-15.17062	-7.46363
5.000	-8.49352	-35.35291	15.00399	-11.85540	-8.48526
5.250	-9.89789	-33.86314	13.59962	-10.36563	-9.88118
5.500	-11.68800	-33.39252	11.80951	-9.89501	-11.65945
5.750	-13.86530	-33.63833	9.63221	-10.14082	-13.82046
6.000	-16.39363	-34.45966	7.10388	-10.96215	-16.32705
6.250	-19.10985	-35.78758	4.38766	-12.29007	-19.01820
6.500	-21.55871	-37.59424	1.93880	-14.09673	-21.45252
6.750	-23.07889	-39.86196	.41862	-16.36445	-22.98942
7.000	-23.58822	-42.43327	-.09070	-18.93576	-23.53260
7.250	-23.71991	-44.41623	-.22239	-20.91871	-23.68375
7.500	-24.01298	-44.13953	-.51547	-20.64202	-23.97169
7.750	-24.71411	-42.18583	-1.21660	-18.68832	-24.63775
8.000	-25.95015	-40.20792	-2.45264	-16.71041	-25.79088
8.250	-27.84607	-38.74408	-4.34856	-15.24657	-27.50721
8.500	-30.56305	-37.85435	-7.06554	-14.35684	-29.82076
8.750	-34.10377	-37.52232	-10.60626	-14.02481	-32.47540
9.000	-36.74130	-37.74095	-13.24379	-14.24344	-34.20281
9.250	-35.43877	-38.52838	-11.94126	-15.03087	-33.70482
9.500	-33.13283	-39.93164	-9.63532	-16.43413	-32.30930
9.750	-31.67197	-42.01679	-8.17446	-18.51928	-31.26897
10.000	-31.09540	-44.76817	-7.59789	-21.27066	-30.91355
10.250	-31.27701	-47.53546	-7.77950	-24.03795	-31.17610
10.500	-32.14629	-48.30338	-8.64878	-24 30587	-32.04301
10.750	-33.62389	-47.01019	-10.12638	-23.51268	-33.42987
11.000	-35.21642	-45.70091	-11.71891	-22.20340	-34.84506
11.250	-35.19639	-45.08536	-11.69888	-21.58785	-34.77293
11.500	-32.81767	-45.21359	-9.32016	-21.71608	-32.57515
11.750	-29.95611	-46.06618	-6.45860	-22.56867	-29.85171
12.000	-27.59606	-47.68479	-4.09855	-24.18728	-27.55440

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(2.9700531E-01)= -10.8422015

20LOG(MAX(FIELD-Y))=20LOG(1.9187323E-02)= -34.3397123

Appendix D2. Distribution comparisons.

THETA = 90°.

ANGLE	DB (1)	DB (2)	DIFF
	C234	C300	
-12.000	-24.14811	-21.91732	-2.23079
-11.750	-21.77160	-19.84036	-1.93124
-11.500	-18.96485	-17.92928	-1.03557
-11.250	-16.55374	-16.31173	-.24201
-11.000	-14.68897	-15.02778	.33881
-10.750	-13.34323	-14.08971	.74648
-10.500	-12.46786	-13.49870	1.03084
-10.250	-12.02258	-13.24960	1.22702
-10.000	-11.97641	-13.33073	1.35432
-9.750	-12.30079	-13.71934	1.41855
-9.500	-12.95536	-14.36953	1.41417
-9.250	-13.85739	-15.18559	1.32820
-9.000	-14.81989	-15.97126	1.15137
-8.750	-15.47703	-16.38016	.90313
-8.500	-15.37538	-16.01865	.64327
-8.250	-14.37971	-14.79300	.41329
-8.000	-12.81069	-13.01605	.20536
-7.750	-11.05612	-11.07300	.01688
-7.500	-9.34664	-9.20689	-.13975
-7.250	-7.79100	-7.53465	-.25635
-7.000	-6.43960	-6.10558	-.33402
-6.750	-5.31619	-4.93698	-.37921
-6.500	-4.43047	-4.03095	-.39952
-6.250	-3.78289	-3.38145	-.40144
-6.000	-3.36579	-2.97644	-.38935
-5.750	-3.16185	-2.79644	-.36541
-5.500	-3.13956	-2.80995	-.32961
-5.250	-3.24574	-2.96535	-.28039
-5.000	-3.39804	-3.18167	-.21637
-4.750	-3.48713	-3.34690	-.14023
-4.500	-3.40383	-3.34122	-.06261
-4.250	-3.09014	-3.09044	.00030
-4.000	-2.57335	-2.61083	.03748
-3.750	-1.94501	-1.99477	.04976
-3.500	-1.30972	-1.35514	.04542
-3.250	-.75094	-.78408	.03314
-3.000	-.32460	-.34364	.01904
-2.750	-.06624	-.07327	.00703
-2.500	0.00000	0.00000	0.00000
-2.250	-.14514	-.14612	.00098
-2.000	-.51922	-.53354	.01432
-1.750	-1.13703	-1.18429	.04726
-1.500	-2.00135	-2.11332	.11197
-1.250	-3.07394	-3.30036	.22642
-1.000	-4.20510	-4.60742	.40232
-.750	-5.03498	-5.62324	.58826
-.500	-5.09368	-5.71837	.62469
-.250	-4.30433	-4.76439	.46006
0.000	-3.09882	-3.34319	.24437

ORIGINAL PAGE IS
OF POOR QUALITY

D2. Concluded.

ANGLE	DB (1)	DB (2)	DIFF
	C234	C300	
.250	-2.04095	-2.34527	.30432
.500	-1.07286	-1.25751	.18465
.750	-.40068	-.50233	.10165
1.000	-.04235	-.08508	.04273
1.250	0.00000	0.00000	0.00000
1.500	-.27323	-.24220	-.03103
1.750	-.86161	-.80876	-.05285
2.000	-1.75994	-1.69301	-.06693
2.250	-2.94314	-2.86847	-.07467
2.500	-4.33138	-4.25198	-.07940
2.750	-5.73056	-5.64157	-.08899
3.000	-6.80966	-6.69584	-.11382
3.250	-7.29079	-7.14038	-.15041
3.500	-7.25581	-7.07962	-.17619
3.750	-7.05609	-6.88153	-.17456
4.000	-6.99535	-6.85408	-.14127
4.250	-7.23678	-7.16474	-.07204
4.500	-7.85643	-7.90160	.04517
4.750	-8.89720	-9.13290	.23570
5.000	-10.39843	-10.94753	.54910
5.250	-12.41177	-13.49848	1.08671
5.500	-15.01209	-17.09033	2.07824
5.750	-18.30469	-22.42539	4.12070
6.000	-22.40797	-30.56404	8.15607
6.250	-27.26537	-29.17085	1.90548
6.500	-31.63436	-25.00198	-6.63238
6.750	-32.55070	-23.41058	-9.14012
7.000	-30.47017	-23.08385	-7.38632
7.250	-27.42161	-23.03615	-4.38546
7.500	-24.49587	-22.31259	-2.18328
7.750	-22.13966	-20.76005	-1.37961
8.000	-20.42633	-19.02907	-1.39726
8.250	-19.31107	-17.60189	-1.70918
8.500	-18.73314	-16.63033	-2.10281
8.750	-18.63982	-16.12774	-2.51208
9.000	-18.98321	-16.07051	-2.91270
9.250	-19.70167	-16.42508	-3.27659
9.500	-20.68253	-17.14196	-3.54057
9.750	-21.71122	-18.12662	-3.58460
10.000	-22.48093	-19.19286	-3.28807
10.250	-22.79412	-20.05344	-2.74068
10.500	-22.78646	-20.47458	-2.31188
10.750	-22.80047	-20.51442	-2.28605
11.000	-23.14073	-20.47209	-2.66864
11.250	-24.02648	-20.64002	-3.38646
11.500	-25.66674	-21.20886	-4.45788
11.750	-28.37549	-22.30550	-6.06999
12.000	-32.73035	-24.05096	-8.67939

Appendix D3. Random error analysis.

X COORDINATE WITH RANDOM ERROR APPLIED

XTRUE	XOBS	ERROR	XTRUE	XOBS	ERROR
-9.71960	-9.71983	.00023	-9.71718	-9.71730	.00012
-10.16928	-10.17014	.00079	-10.17418	-10.17536	.00121
-9.81170	-9.81127	-.00043	-9.86130	-9.86232	.00102
-10.09590	-10.09719	.00129	-10.17080	-10.17001	.00026
-9.98820	-9.98817	-.00003	-9.99900	-9.99869	-.00031
-10.68128	-10.68286	.00101	-10.66030	-10.66037	.00007
-9.17240	-9.17271	-.00049	-9.22718	-9.22828	.00118
-10.10975	-10.11052	.00077	-10.14108	-10.14103	-.00005
-9.81270	-9.81234	-.00036	-9.82710	-9.82817	.00107
-10.80470	-10.80596	.00126	-10.81899	-10.81492	-.00007
-9.49890	-9.49782	-.00107	-9.84310	-9.84438	.00128
-9.48045	-9.48071	.00026	-9.49700	-9.49814	.00109
-9.30770	-9.30772	.00002	-9.34148	-9.34271	.00124
-9.61790	-9.61912	.00122	-9.64900	-9.64856	-.00044
-9.36980	-9.37003	.00023	-9.41740	-9.41831	.00091
-9.82745	-9.82702	-.00043	-9.87790	-9.87874	.00084
-9.09805	-9.09821	.00016	-9.13150	-9.13149	-.00001
-9.87080	-9.87067	-.00013	-9.89870	-9.89747	-.00123
-9.13280	-9.13196	-.00084	-9.13763	-9.13706	-.00057
-10.08225	-10.08299	.00074	-10.07800	-10.07671	-.00129
-9.84260	-9.84310	.00050	-9.89895	-9.89771	-.00124
-10.10020	-10.09985	-.00035	-10.12705	-10.12754	.00049
-9.72240	-9.72254	.00014	-9.98925	-9.99033	.00108
-10.30415	-10.30387	-.00028	-10.33495	-10.33517	.00022
-9.60595	-9.60476	-.00119	-9.64365	-9.64474	.00109
-10.31105	-10.31023	-.00082	-10.33455	-10.33480	.00025
-9.65065	-9.64936	-.00129	-9.68000	-9.68118	.00118
-10.49785	-10.49895	.00110	-10.51670	-10.51672	.00002
-9.34695	-9.34582	-.00113	-9.40160	-9.40175	.00015
-10.53370	-10.53516	.00126	-10.55470	-10.55568	.00098
-9.30130	-9.30024	-.00106	-9.32720	-9.32782	.00062
-10.65230	-10.65335	.00085	-10.66900	-10.66849	-.00051
-9.10045	-9.10031	-.00014	-9.13210	-9.13338	.00128
-10.73280	-10.73409	.00129	-10.74975	-10.74952	-.00023
-9.35980	-9.35971	-.00009	-9.37960	-9.37864	-.00096
-10.81400	-10.81512	.00112	-10.82570	-10.82442	-.00128
-9.07570	-9.07449	-.00121	-9.10760	-9.10631	-.00129
-10.85510	-10.85635	.00125	-10.86725	-10.86596	-.00129
-9.17130	-9.17241	.00111	-9.18775	-9.18647	-.00128
-10.93630	-10.93730	.00100	-10.94345	-10.94263	-.00082
-7.80305	-7.80344	.00039	-7.82130	-7.82081	-.00049
-11.04810	-11.04711	-.00099	-11.05605	-11.05734	.00129
-9.10115	-9.10064	-.00051	-9.11170	-9.11222	.00052
-11.01670	-11.01603	-.00067	-11.03065	-11.03137	.00072
-7.73815	-7.73824	.00009	-7.74865	-7.74761	-.00104
-11.13270	-11.13322	.00052	-11.13740	-11.13698	-.00042
-9.13740	-9.13665	-.00075	-9.13965	-9.14035	.00070
-11.04525	-11.04407	-.00120	-11.04735	-11.04727	-.00008
-7.74790	-7.74666	-.00124	-7.74970	-7.74860	-.00110
-11.15565	-11.15509	-.00056	-11.15580	-11.15575	-.00007
-9.58760	-9.58822	.00062	-9.64610	-9.64558	-.00052
-9.85440	-9.85545	.00105	-9.94855	-9.94942	.00087
-9.28450	-9.28490	.00040	-9.28275	-9.28371	.00096
-10.49260	-10.49241	-.00017	-10.49810	-10.49869	.00059
-9.12748	-9.12728	-.00020	-9.13385	-9.13514	.00129
-10.49180	-10.49295	.00115	-10.50320	-10.50360	.00040
-9.91540	-9.91621	.00081	-9.93755	-9.93848	.00093
-10.44800	-10.44922	.00122	-10.46240	-10.46137	-.00103
-9.23130	-9.23131	.00001	-9.23985	-9.23993	.00008
-10.98740	-10.98769	.00029	-10.99165	-10.99294	.00129
-9.44470	-9.44536	.00066	-9.49930	-9.50010	.00080
-9.75140	-9.75234	.00094	-9.80615	-9.80509	-.00106
-9.47040	-9.47000	-.00040	-9.50470	-9.50435	-.00035
-9.62030	-9.62150	.00120	-9.65850	-9.65839	-.00011
-9.27000	-9.27001	.00001	-9.30180	-9.30081	-.00099
-9.73235	-9.73363	.00128	-9.76290	-9.76187	-.00103
-9.26490	-9.26571	.00081	-9.29760	-9.29744	-.00016
-9.87300	-9.87342	.00042	-9.91095	-9.91221	.00126
-9.00670	-9.00763	.00093	-9.04290	-9.04240	-.00050
-9.93545	-9.93422	-.00123	-9.96325	-9.96293	-.00032
-9.07825	-9.07729	-.00096	-9.10310	-9.10416	.00106
-10.19040	-10.19161	.00121	-10.17410	-10.17475	.00065
-9.80710	-9.80881	-.00127	-9.84150	-9.84148	-.00008
-10.19780	-10.19786	.00001	-10.22410	-10.22295	-.00115
-9.78975	-9.78939	-.00036	-9.81675	-9.81697	.00022
-10.32460	-10.32499	.00039	-10.34940	-10.34821	-.00119
-9.43610	-9.43483	-.00127	-9.47330	-9.47419	.00089
-10.45045	-10.45174	.00129	-10.47305	-10.47208	-.00097
-9.34575	-9.34567	-.00008	-9.37535	-9.37533	-.00002
-10.54610	-10.54611	.00001	-10.55670	-10.55787	.00117
-9.18000	-9.18000	0.00000	-9.21380	-9.21509	.00129
-10.65865	-10.65731	-.00129	-10.67730	-10.67694	-.00036
-9.28000	-9.28128	.00128	-9.30675	-9.30633	-.00042
-10.74465	-10.74366	-.00099	-10.75960	-10.76064	.00104
-9.12740	-9.12616	-.00124	-9.14995	-9.15010	.00015
-10.89930	-10.90057	.00127	-10.90875	-10.90855	-.00020
-7.88575	-7.88570	-.00005	-7.90630	-7.90647	.00017
-10.97595	-10.97675	.00080	-10.98640	-10.98686	.00046
-7.94700	-7.94587	-.00113	-7.96410	-7.96363	-.00047
-11.02760	-11.02652	-.00108	-11.03515	-11.03436	-.00079
-7.70980	-7.70920	-.00060	-7.72210	-7.72268	.00058
-11.11110	-11.11158	.00048	-11.11706	-11.11719	.00014
-8.00145	-8.00238	.00093	-8.00855	-8.00838	-.00017
-11.07325	-11.07320	-.00005	-11.07345	-11.07386	.00041
-7.75725	-7.75848	.00123	-7.76420	-7.76518	.00098
-11.14710	-11.14606	-.00104	-11.15025	-11.14978	-.00047
-7.89760	-7.89773	.00013	-7.89760	-7.89709	-.00051
-11.12270	-11.12292	.00022	-11.12225	-11.12183	-.00042
-7.63750	-7.63707	-.00043	-7.63955	-7.63977	.00022
-11.18725	-11.18821	.00096	-11.18685	-11.18807	.00122
-9.88845	-9.88734	-.00111	-10.01105	-10.01128	.00023
-9.80095	-9.79975	-.00120	-9.95110	-9.95103	-.00007
-9.70400	-9.70321	-.00127	-9.84315	-9.84444	.00129
-9.58260	-9.58237	-.00023	-9.73785	-9.73665	-.00120
-9.67205	-9.67294	.00089	-10.12380	-10.12321	-.00059
-9.46470	-9.46494	.00024	-10.08970	-10.08869	-.00099
-9.38795	-9.38875	.00080	-9.99025	-9.99076	.00051
-9.46990	-9.47072	.00082	-10.37205	-10.37097	-.00108
-9.43460	-9.43359	-.00101	-10.34310	-10.34188	-.00122
-9.31230	-9.31354	.00124	-10.36605	-10.36599	-.00013
-9.13445	-9.13316	-.00129	-10.35115	-10.34990	-.00125
-9.26225	-9.26225	0.00000	-10.46925	-10.46936	.00011
-9.08810	-9.08926	.00116	-10.48820	-10.48921	.00101
-8.96245	-8.96355	.00110	-10.62980	-10.63067	.00087
-8.90790	-8.90672	-.00118	-10.38745	-10.38863	.00118
-9.10030	-9.10148	.00118	-10.61525	-10.61441	-.00084
-8.78250	-8.78289	.00039	-10.73700	-10.73577	-.00123

Random error analysis.

Y COORDINATE WITH RANDOM ERROR APPLIED

YTRUE	YERR	ERROR	YTRUE	YERR	ERROR
.60020	.59918	.00102	-.40035	-.60142	.00107
.60015	.60037	-.00022	-.60020	-.60007	-.00013
2.00050	2.00129	-.00079	-2.00040	-2.00141	.00101
2.00045	2.00170	-.00125	-2.00040	-2.00143	.00103
1.00035	.99906	.00129	-1.00010	-1.00036	.00026
1.00025	1.00028	-.00003	-1.00010	-1.00105	.00095
3.40045	3.40151	-.00106	-3.40050	-3.40116	.00066
3.40045	3.39934	.00111	-3.40050	-3.39946	-.00104
1.80030	1.79902	.00128	-1.80025	-1.80140	.00115
1.80030	1.79970	.00060	-1.80020	-1.80142	.00122
4.00055	4.00049	.00006	-4.00030	-4.00013	-.00017
4.00055	3.99953	.00102	-4.00035	-3.99916	-.00117
4.60055	4.60183	-.00128	-4.60060	-4.60129	.00069
4.60045	4.60164	-.00119	-4.60060	-4.60188	.00128
3.80065	3.79988	.00077	-3.80025	-3.79896	-.00129
3.80060	3.79932	.00128	-3.80035	-3.80123	.00088
4.40015	4.39909	.00106	-4.40045	-4.39949	-.00096
4.40015	4.40122	-.00107	-4.40045	-4.40164	.00119
3.80065	3.79940	.00125	-3.80030	-3.80155	.00125
3.80065	3.79954	.00111	-3.80030	-3.80040	.00010
4.20030	4.19913	.00117	-4.20055	-4.19985	-.00070
4.20045	4.20045	0.00000	-4.20040	-4.20140	.00100
3.40035	3.40164	-.00129	-3.40050	-3.40135	.00085
3.40040	3.39913	.00127	-3.40050	-3.40127	.00077
4.00050	3.99925	.00125	-4.00035	-4.00006	-.00029
4.00060	4.00141	-.00081	-4.00035	-3.99908	-.00127
3.20055	3.19931	.00124	-3.20005	-3.20063	.00058
3.20055	3.20175	-.00120	-3.20010	-3.20108	.00098
3.60010	3.59881	.00129	-3.60025	-3.60117	.00092
3.60010	3.60022	-.00012	-3.60025	-3.59904	.00121
2.80050	2.80143	-.00093	-2.80045	-2.80153	.00108
2.80050	2.80070	-.00020	-2.80050	-2.79950	-.00100
3.20040	3.19999	.00041	-3.20015	-3.19997	-.00018
3.20050	3.19998	.00052	-3.20010	-3.19898	-.00112
2.20005	2.20098	-.00093	-2.20040	-2.19953	-.00087
2.20015	2.19976	.00039	-2.20040	-2.19991	-.00049
2.60015	2.60070	-.00055	-2.60050	-2.60068	.00018
2.60015	2.60134	-.00119	-2.60040	-2.59975	-.00065
1.80035	1.80040	-.00005	-1.80025	-1.80148	.00123
1.80030	1.80059	-.00029	-1.80020	-1.80041	.00021
1.80035	1.80022	.00013	-1.80025	-1.80026	.00001
1.80040	1.79919	.00121	-1.80020	-1.80001	-.00019
1.20040	1.20157	-.00117	-1.20010	-1.20083	.00073
1.20035	1.19907	.00128	-1.00010	-1.00093	.00083
.99995	.99901	.00094	-1.00010	-1.00046	.00036
1.00020	1.00148	-.00128	-1.00020	-1.00071	.00051
.40032	.40111	-.00079	-.40045	-.40020	-.00025
.40030	.40104	-.00074	-.40040	-.39947	-.00093
.20030	.19910	.00120	-.20055	-.20184	.00129
.20040	.20128	-.00088	-.20060	-.19951	-.00109
2.80050	2.80077	-.00027	-2.80040	-2.79940	-.00100
2.80055	2.79941	.00114	-2.80055	-2.80165	.00110
.60025	.59924	.00101	-.60020	-.59891	-.00129
.60020	.60025	-.00005	-.60020	-.60110	.00090
1.80030	1.80142	-.00112	-1.80020	-1.80012	-.00008
1.80035	1.79998	.00037	-1.80025	-1.80139	.00114
2.80055	2.80184	-.00129	-2.80045	-2.80142	.00097
2.80060	2.80004	.00056	-2.80055	-2.79954	-.00101
1.00030	.99924	.00106	-1.00015	-1.00108	.00093
1.00025	1.00026	-.00001	-1.00015	-1.00007	-.00008
3.80060	3.79975	.00085	-3.80020	-3.80132	.00112
3.80065	3.80037	.00028	-3.80025	-3.79981	-.00044
4.20040	4.19991	.00049	-4.20045	-4.20171	.00126
4.20040	4.20158	-.00118	-4.20055	-4.19945	-.00110
4.40010	4.40050	-.00040	-4.40045	-4.40014	-.00031
4.40010	4.39951	.00059	-4.40045	-4.40080	.00035
4.00055	4.00076	-.00021	-4.00030	-4.00159	.00129
4.00055	3.99957	.00098	-4.00035	-4.00093	.00058
4.40000	4.40003	-.00003	-4.40040	-4.39923	-.00117
4.40015	4.40005	.00010	-4.40045	-4.39941	-.00104
3.60010	3.60038	-.00028	-3.60020	-3.60064	.00044
3.60015	3.60025	-.00010	-3.60020	-3.59894	-.00126
4.00055	4.00132	-.00077	-4.00035	-3.99926	-.00109
4.00055	4.00095	-.00040	-4.00040	-4.00071	.00031
3.60010	3.59884	.00126	-3.60020	-3.60027	.00007
3.60010	3.59911	.00099	-3.60025	-3.59957	-.00068
3.80050	3.79926	.00124	-3.80030	-3.80026	-.00004
3.80040	3.80049	-.00009	-3.80020	-3.79991	-.00029
3.20045	3.19916	.00129	-3.20000	-3.19895	-.00105
3.20055	3.19959	.00096	-3.20010	-3.20105	.00095
3.40035	3.40141	-.00106	-3.40055	-3.39934	-.00121
3.40040	3.40105	-.00065	-3.40050	-3.40050	0.00000
2.80055	2.80067	-.00012	-2.80045	-2.80046	.00001
2.80050	2.80165	-.00115	-2.80045	-2.80009	-.00036
2.20000	2.19880	.00120	-2.20030	-2.20107	.00077
2.20000	2.20016	-.00016	-2.20035	-2.20077	.00042
2.20000	2.19963	.00037	-2.20045	-2.20153	.00108
2.20010	2.19921	.00089	-2.20040	-2.20141	.00101
1.60010	1.60092	-.00082	-1.60040	-1.60173	.00133
1.60045	1.60130	-.00085	-1.60045	-1.60169	.00124
1.40040	1.40056	-.00016	-1.40000	-1.40107	.00107
1.40045	1.39923	.00122	-1.40000	-1.39922	-.00128
.80045	.80097	-.00052	-.80075	-.80067	.00048
.80065	.79936	.00129	-.80025	-.80141	.00116
.20025	.20035	-.00010	-.20020	-.20120	.00100
.60020	.60104	-.00084	-.60020	-.60148	.00128
0.00000	-.00111	.00111	-.20060	-.20040	-.00020
.00005	.00132	-.00127	-.20060	-.20188	.00128
.20030	.20047	-.00017	-.20065	-.20167	.00102
.20045	.20048	-.00003	-.20060	-.20129	.00069
.80065	.80108	-.00040	.80040	.80187	-.00147
1.40040	1.40099	-.00059	1.40040	1.40149	-.00109
2.20000	2.20067	-.00067	2.20010	2.19956	.00054
3.20055	3.20009	.00046	3.20050	3.19924	.00126
1.20040	1.20005	.00035	1.20040	1.19915	.00125
2.40030	2.40030	0.00000	2.40030	2.39931	.00099
3.00065	3.00194	-.00129	3.00070	3.00055	.00015
.40040	.40169	-.00129	.40035	.40006	.00029
1.20045	1.20160	-.00115	1.20045	1.20033	.00012
1.80030	1.79974	.00056	1.80030	1.79939	.00091
2.60015	2.59893	.00122	2.60015	2.60083	-.00068
1.20045	1.19939	.00106	1.20045	1.19967	.00078
2.20000	2.20030	-.00030	2.20015	2.19915	.00100
1.40040	1.39924	.00116	1.40045	1.39935	.00110
2.00020	1.99924	[illegible]	2.00045	2.00054	-.00011
.40040	.40048	-.00008	.40035	.40014	.00021
1.00030	1.00017	.00013	1.00025	1.00096	-.00070

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Random error analysis.

Z COORDINATE WITH RANDOM ERROR APPLIED

ZTRUE	ZERR	ERROR	ZTRUE	ZERR	ERROR
8.38800	8.38921	-.00121	8.38770	8.38727	.00043
7.18740	7.18842	-.00102	7.18700	7.18827	-.00127
8.58760	8.58738	.00022	8.58770	8.58773	-.00003
6.98745	6.98801	-.00056	6.98675	6.98574	.00101
9.98775	9.98900	-.00125	9.98805	9.98702	.00103
5.58690	5.58794	-.00104	5.58690	5.58812	-.00122
8.98840	8.98956	-.00116	8.98785	8.98760	.00025
6.58715	6.58624	.00091	6.58745	6.58738	.00007
10.78815	10.78752	.00063	10.78795	10.78913	-.00118
4.78715	4.78716	-.00001	4.78725	4.78738	-.00013
7.98780	7.98816	-.00036	7.98795	7.98903	-.00108
7.58720	7.58636	.00084	7.58730	7.58795	-.00065
8.18765	8.18832	-.00067	8.18790	8.18918	-.00128
7.38710	7.38679	.00031	7.38720	7.38647	.00073
8.38765	8.38654	.00111	8.38795	8.38785	.00010
7.18690	7.18627	.00063	7.18705	7.18829	-.00124
8.78780	8.78737	.00043	8.78800	8.78678	.00122
6.78685	6.78556	.00129	6.78725	6.78843	-.00118
8.98800	8.98926	-.00126	8.98780	8.98712	.00068
6.58670	6.58579	.00091	6.58745	6.58788	-.00043
9.38790	9.38707	.00083	9.38806	9.38886	-.00080
6.18705	6.18745	-.00040	6.18725	6.18846	-.00121
9.58770	9.58751	.00019	9.58785	9.58676	.00109
5.98725	5.98653	.00072	5.98710	5.98599	.00111
9.98790	9.98732	.00058	9.98800	9.98914	-.00114
5.58705	5.58794	-.00089	5.58725	5.58709	.00016
10.18835	10.18954	-.00119	10.18775	10.18702	.00073
5.38680	5.38748	-.00068	5.38660	5.38693	-.00033
10.58775	10.58898	-.00123	10.58785	10.58907	-.00122
4.98700	4.98656	.00044	4.98740	4.98809	-.00069
10.58780	10.58651	.00129	10.58820	10.58728	.00092
4.98725	4.98679	.00046	4.98710	4.98590	.00120
11.18790	11.18841	-.00051	11.18765	11.18874	-.00109
4.38755	4.38682	.00073	4.38750	4.38621	.00129
10.98765	10.98878	-.00113	10.98805	10.98785	.00020
4.58730	4.58717	.00013	4.58685	4.58558	.00127
11.38795	11.38794	.00001	11.38780	11.38909	-.00129
4.18675	4.18664	.00011	4.18725	4.18701	.00024
11.38765	11.38729	.00036	11.38805	11.38748	.00057
4.18715	4.18829	-.00114	4.18745	4.18633	.00112
11.98770	11.98898	-.00128	11.98830	11.98868	-.00038
3.58660	3.58674	-.00014	3.58710	3.58668	.00042
11.58765	11.58636	.00129	11.58775	11.58898	-.00123
3.98715	3.98667	.00048	3.98690	3.98819	-.00129
12.18760	12.18792	-.00032	12.18800	12.18848	-.00048
3.38710	3.38692	.00018	3.38720	3.38848	-.00128
11.58835	11.58712	.00123	11.58840	11.58795	.00045
3.98705	3.98577	.00128	3.98670	3.98548	.00122
12.18790	12.18801	-.00011	12.18785	12.18908	-.00123
3.38705	3.38576	.00129	3.38690	3.38561	.00129
8.18775	8.18730	.00045	8.18790	8.18755	.00035
7.38750	7.38654	.00096	7.38720	7.38748	-.00028
9.38760	9.38645	.00115	9.38810	9.38864	-.00054
6.18695	6.18567	.00128	6.18725	6.18637	.00088
9.58800	9.58839	-.00039	9.58790	9.58748	.00042
5.98740	5.98741	-.00001	5.98685	5.98603	.00082
9.78785	9.78776	.00009	9.78785	9.78914	-.00129
5.78720	5.78746	-.00026	5.78735	5.78765	-.00030
11.38785	11.38914	-.00129	11.38780	11.38683	.00097
4.18690	4.18796	-.00106	4.18740	4.18611	.00129
8.18770	8.18734	.00036	8.18790	8.18674	.00116
7.38730	7.38730	0.00000	7.38700	7.38699	.00001
7.98755	7.98655	.00100	7.98805	7.98929	-.00124
7.58685	7.58567	.00118	7.58725	7.58767	-.00042
8.38800	8.38899	-.00099	8.38775	8.38785	-.00010
7.18745	7.18772	-.00027	7.18710	7.18597	.00113
8.58790	8.58663	.00127	8.58770	8.58790	-.00020
6.78720	6.78841	-.00121	6.98725	6.98616	.00109
8.78840	8.78803	.00037	8.98795	8.98666	.00129
6.58740	6.58648	.00092	6.58695	6.58809	-.00114
9.18785	9.18785	0.00000	9.18835	9.18964	-.00129
6.38725	6.38596	.00129	6.38750	6.38735	.00015
9.58800	9.58672	.00128	9.58820	9.58861	-.00041
5.98745	5.98844	-.00099	5.98740	5.98636	.00104
9.78790	9.78718	.00072	9.78780	9.78780	0.00000
5.78725	5.78610	.00115	5.78725	5.78700	.00025
10.38810	10.38753	.00057	10.38770	10.38873	-.00103
5.18710	5.18803	-.00093	5.18710	5.18581	.00129
10.38780	10.38704	.00076	10.38785	10.38830	-.00045
5.18735	5.18623	.00112	5.18730	5.18703	.00027
10.98815	10.98859	-.00044	10.98785	10.98775	.00010
4.58740	4.58825	-.00085	4.58710	4.58839	-.00129
10.98780	10.98890	-.00110	10.98770	10.98810	-.00040
4.58745	4.58714	.00031	4.58710	4.58584	.00126
11.38820	11.38761	.00059	11.38765	11.38787	-.00022
4.18705	4.18576	.00129	4.18730	4.18614	.00116
11.78795	11.78923	-.00128	11.78785	11.78700	.00085
3.78705	3.78725	-.00020	3.78725	3.78759	-.00034
11.78780	11.78759	.00021	11.78785	11.78803	.00018
3.78690	3.78770	-.00080	3.78725	3.78801	-.00076
12.18815	12.18687	.00128	12.18805	12.18834	-.00029
3.38755	3.38717	.00038	3.38720	3.38712	.00008
11.78780	11.78654	.00126	11.78755	11.78639	.00116
3.78705	3.78724	-.00019	3.78710	3.78839	-.00129
12.18835	12.18791	.00044	12.18785	12.18788	-.00003
3.38680	3.38659	.00021	3.38735	3.38859	-.00124
11.98755	11.98884	-.00129	11.98800	11.98877	-.00077
3.58710	3.58694	.00016	3.58735	3.58858	-.00123
12.38795	12.38872	-.00077	12.38810	12.38696	.00114
3.18730	3.18825	-.00095	3.18720	3.18748	-.00028
7.98795	7.98875	-.00080	7.58695	7.58571	.00124
7.98795	7.98668	.00127	7.58715	7.58709	.00006
7.98770	7.98855	-.00085	7.58740	7.58672	.00068
7.98775	7.98674	.00101	7.58710	7.58652	.00058
8.38755	8.38884	-.00129	7.18700	7.18633	.00067
8.58785	8.58746	.00039	6.98710	6.98624	.00086
8.58810	8.58688	.00122	6.98730	6.98653	.00077
8.98760	8.98821	-.00061	6.58695	6.58743	-.00048
8.98790	8.98671	.00119	6.58690	6.58817	-.00127
9.18820	9.18945	-.00125	6.38710	6.38613	.00097
9.38820	9.38766	.00054	6.18720	6.18744	-.00024
9.38780	9.38736	.00044	6.18735	6.18624	.00111
9.58750	9.58701	.00049	5.98665	5.98579	.00086
9.98820	9.98726	.00094	5.58755	5.58639	.00116
9.98760	9.98881	-.00121	5.58740	5.58696	.00044
9.78775	9.78878	-.00103	5.78715	5.78603	.00112
10.38850	10.38772	.00078	5.18715	5.18690	.00025

Random error analysis.

ANGLE	DB ORIG	DB ERR	DIFF
-12.000	-24.14811	-30.46297	6.31486
-11.750	-21.77160	-26.82393	5.05233
-11.500	-18.96485	-22.18459	3.21974
-11.250	-16.55374	-18.78667	2.23293
-11.000	-14.68897	-16.39171	1.70274
-10.750	-13.34323	-14.74887	1.40564
-10.500	-12.46786	-13.71222	1.24436
-10.250	-12.02258	-13.19871	1.17613
-10.000	-11.97641	-13.16003	1.18362
-9.750	-12.30079	-13.56379	1.26300
-9.500	-12.95536	-14.37146	1.41610
-9.250	-13.85739	-15.49079	1.63340
-9.000	-14.81989	-16.66230	1.84241
-8.750	-15.47703	-17.31011	1.83308
-8.500	-15.37538	-16.80520	1.42982
-8.250	-14.37971	-15.24658	.86687
-8.000	-12.81069	-13.24903	.43834
-7.750	-11.05612	-11.23000	.17388
-7.500	-9.34664	-9.35699	.01035
-7.250	-7.79100	-7.69227	-.09873
-7.000	-6.43960	-6.26301	-.17659
-6.750	-5.31619	-5.08230	-.23389
-6.500	-4.43047	-4.15498	-.27549
-6.250	-3.78289	-3.47940	-.30349
-6.000	-3.36579	-3.04767	-.31812
-5.750	-3.16185	-2.84378	-.31807
-5.500	-3.13956	-2.83894	-.30062
-5.250	-3.24574	-2.98340	-.26234
-5.000	-3.39804	-3.19646	-.20158
-4.750	-3.48713	-3.36373	-.12340
-4.500	-3.40383	-3.36006	-.04377
-4.250	-3.09014	-3.10602	.01588
-4.000	-2.57335	-2.61708	.04373
-3.750	-1.94501	-1.98949	.04448
-3.500	-1.30772	-1.34076	.03304
-3.250	-.75094	-.76566	.01472
-3.000	-.32460	-.32684	.00224
-2.750	-.06624	-.06306	-.00318
-2.500	0.00000	0.00000	0.00000
-2.250	-.14514	-.15815	.01301
-2.000	-.51922	-.55700	.03778
-1.750	-1.13703	-1.21507	.07804
-1.500	-2.00135	-2.14175	.14040
-1.250	-3.07394	-3.30826	.23432
-1.000	-4.20510	-4.56842	.36332
-.750	-5.03498	-5.52565	.49067
-.500	-5.09368	-5.61501	.52133
-.250	-4.30433	-4.73784	.43351
0.000	-3.09882	-3.41797	.31915
.250	-2.04095	-2.15859	.11764
.500	-1.07286	-1.13656	.06370
.750	-.40068	-.43200	.03132
1.000	-.04235	-.05436	.01201
1.250	0.00000	0.00000	0.00000
1.500	-.27323	-.26436	-.00887
1.750	-.86161	-.84307	-.01854
2.000	-1.75994	-1.72587	-.03407
2.250	-2.94314	-2.87986	-.06328
2.500	-4.33138	-4.21390	-.11748
2.750	-5.73056	-5.52529	-.20527
3.000	-6.80966	-6.49980	-.30986
3.250	-7.29079	-6.91140	-.37939
3.500	-7.25581	-6.87110	-.38471
3.750	-7.05609	-6.70670	-.34939
4.000	-6.99535	-6.69132	-.30403
4.250	-7.23678	-6.97347	-.26331
4.500	-7.85643	-7.62449	-.23194
4.750	-8.89720	-8.68544	-.21176
5.000	-10.39843	-10.19314	-.20529
5.250	-12.41177	-12.19418	-.21759
5.500	-15.01209	-14.75441	-.25768
5.750	-18.30469	-17.96780	-.33689
6.000	-22.40797	-21.96384	-.44413
6.250	-27.26537	-26.88504	-.38033
6.500	-31.63436	-32.38036	.74600
6.750	-32.55070	-34.00647	1.45577
7.000	-30.47017	-30.24943	-.22074
7.250	-27.42161	-26.44931	-.97230
7.500	-24.49587	-23.47832	-1.01755
7.750	-22.13966	-21.27884	-.86082
8.000	-20.42633	-19.74769	-.67864
8.250	-19.31107	-18.79609	-.51498
8.500	-18.73314	-18.35338	-.37974
8.750	-18.63982	-18.35947	-.28035
9.000	-18.98321	-18.74921	-.23400
9.250	-19.70167	-19.42557	-.27610
9.500	-20.68253	-20.22404	-.45849
9.750	-21.71122	-20.90580	-.80541
10.000	-22.48093	-21.26404	-1.21689
10.250	-22.79412	-21.30664	-1.48748
10.500	-22.78646	-21.26199	-1.52447
10.750	-22.80047	-21.40199	-1.39848
11.000	-23.14073	-21.93915	-1.20158
11.250	-24.02648	-23.04506	-.98142
11.500	-25.66674	-24.91333	-.75341
11.750	-28.37549	-27.83179	-.54370
12.000	-32.73035	-32.06560	-.66475

APPENDIX E

PROGRAMS AND LISTINGS

Appendix E1. Subroutine GELIM.

LANGUAGE: FORTRAN

PURPOSE: To solve a system of real linear equations represented by the matrix equation $AX = B$. A is a square matrix of coefficients, X is a rectangular solution matrix, and B is a rectangular matrix whose columns contain the right-hand side constant vectors.

USE: CALL GELIM (NMAX,N,A,NRHS,B,IPIVOT,IFAC,WK,IERR)

NMAX — An input integer specifying the maximum first dimension of the coefficient matrix as given in the dimension statement of the calling program.

N — An input integer specifying the second dimension (order) of the coefficient matrix, where $1 \leq N \leq NMAX$.

A — A two-dimensional input/output array.

Input - The coefficient array with first dimension NMAX and second dimension at least N. Two types of input are possible. The first type is the unfactored coefficient matrix while the second type is the triangular factorization, $A = LU$ where L is

the unit lower triangular matrix and U is an upper triangular matrix. If the user has available the triangular factorization, he should input it as this will save computer time.

Output - If the user did not input the triangular factorization of the coefficient matrix, it will be calculated and stored over the input coefficient matrix. If the user input the triangular factorization it will be returned intact.

See METHOD for more explicit detail regarding the LU factorization of A.

NRHS — An input integer specifying the number of columns of the right-hand side constant matrix.

B — A two-dimensional input/output array with first dimension NMAX and second dimension at least NRHS.

Input - The constant vectors of the systems of equations to be solved.

Output - The solutions of the systems of equations solved and stored over the corresponding input constant vectors.

IPIVOT An input/output integer array dimensioned at least N in the calling program.

Input - If the triangular factorization of A is input, the user must also input in IPIVOT the pivotal strategy used in obtaining the triangular factorization of A. If the unfactored form of A is input, nothing need be input in IPIVOT.

Output - If the unfactored form of A is input, the pivotal strategy used by GELIM to obtain the triangular factorization of A will be returned in IPIVOT. If the factored form of A is input, then the pivotal strategy input by the user will be returned intact.

See METHOD for more explicit details on pivoting.

IFAC — An input/output integer parameter specifying whether or not the triangular factorization of the A matrix is to be computed.

= 0 The unfactored form of A was input so GELIM should compute the triangular factorization A = LU and store it over the input A matrix. IFAC is reset to 1 on return.

= 1 The factored form of A was input so GELIM need not attempt the factorization.

WK — An input array used for temporary work storage and dimensioned at least N in the calling program.

IERR — An output integer error code generated and returned by GELIM.

= 0 A matrix is non-singular.

= 1 A matrix is singular.

Upon return from GELIM, IERR should be tested or written out in the calling program.

GELIM

RESTRICTIONS: The user should note carefully the relation between arrays A and IPIVOT and the use of parameter IFAC.

METHOD: The system of linear equations represented by the matrix equation AX = B is solved by computing a solution to the equivalent problem PAX = PB, where P is a permutation matrix representating the row pivotal strategy associated with the triangular factorization of the A matrix into LU = PA where L is a unit lower triangular matrix and U is an upper triangular matrix. GELIM computes a solution to the equation LUX = PB by solving LY = PB for Y followed by back substitution UX = Y for the desired solution X. The forward and back substitutions are accomplished with the following equations.

$$Y_1 = B_1$$

$$Y_i = B_i - \sum_{k=1}^{i-1} L_{ik} Y_k \quad i = 2, 3, \ldots, N$$

$$X_N = Y_N / U_{NN}$$

$$X_i = [Y_i - \sum_{k=i+1}^{N} U_{ik} X_k] / U_{ii} \quad i = N-1, N-2, \ldots, 1$$

The triangular factorization employs elementary row operations with row pivoting and equivalent L_∞ norm scaling. Row operations and scaling procedures used to decompose the A matrix are thoroughly discussed on pages 70 - 71 of the reference. The pivotal strategy is input/

output from array IPIVOT by the rule IPIVOT(I) = J which relates that row J of matrix A was used to pivot for the I-th unknown. The computed L and U matrices are overstored on the A matrix and can be input/output by generalizing the following example. The general unfactored 3 by 3 coefficient matrix A is given by

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$$

which can be factored into triangular matrices $PA = LU$ where

$$L = \begin{pmatrix} 1 & 0 & 0 \\ \ell_{21} & 1 & 0 \\ \ell_{31} & \ell_{32} & 1 \end{pmatrix} \quad U = \begin{pmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{pmatrix}$$

and this factorization overstored on the input A matrix by

$$A = \begin{pmatrix} u_{11} & u_{12} & u_{13} \\ \ell_{21} & u_{22} & u_{23} \\ \ell_{31} & \ell_{32} & u_{33} \end{pmatrix}$$

with the pivotal strategy specified by the P matrix stored in array IPIVOT.

ACCURACY: The accuracy of the solution matrix X is dependent on how well-conditioned the matrix A is. The error code IERR = 1 implies that the matrix A is ill-conditioned and the solution X is questionable. However, IERR = 0 does not mean that A is not ill-conditioned nor assure any degree of accuracy.

REFERENCE: Wilkinson, J. H., The Solution of Ill-Conditioned Linear Equations, National Physics Laboratory, published in "Mathematical Methods for Digital Computers," Ralston, A., and Wilf, H., Wiley and Sons, Inc., New York.

STORAGE: 256_8 Locations

SUBPROGRAMS USED: DETFAC

FORTRAN FUNCTIONS: ABS,AMAX1.

OTHER CODING INFORMATION: The following example illustrates the use of this routine. To solve the problem AX = B with

$$A = \begin{bmatrix} 2 & 1 & 5 & 1 \\ 1 & 1 & -3 & -4 \\ 3 & 6 & -2 & 1 \\ 2 & 2 & 2 & -3 \end{bmatrix} \qquad B = \begin{bmatrix} 5 \\ -1 \\ 8 \\ 2 \end{bmatrix}$$

The following FORTRAN logic could be implemented.

GELIM


```
      .
      .
      .
DIMENSION A(4,4),B(4,1),IPIVOT(4),WK(4)
      .
      .
      .
N = 4
NMAX = 4
NRHS = 1
IFAC = 0
CALL GELIM (NMAX,N,A,NRHS,B,IPIVOT,IFAC,WK,IERR)
      .
      .
      .
```

The computed solution vector overstored in the B array and returned to the calling program was

$$\underset{\sim}{B} = \begin{bmatrix} 1.9999999999999E+00 \\ 2.0000000000007E-01 \\ 0. \\ 7.9999999999997E-01 \end{bmatrix}$$

and IERR = 0.

SOURCE: Computer Sciences Corporation, Hampton, Va.

QUESTIONS ON THE USE OF THIS PROGRAM SHOULD BE DIRECTED TO THE ACD PROGRAMER GROUP, EXT. 3548.

Appendix E2. Subroutine GETRAN.

LANGUAGE: FORTRAN

PURPOSE: To generate by repeated usage sequences of pseudo-random (random within the capability of a digital computer) numbers having the normal (Gaussian) distribution with zero mean and unit variance and/or the uniform (rectangular) distribution on the unit interval (0, 1).

USE: CALL GETRAN (IR,N,L,RN,Y1,Y2)

IR — A two-location array where, if the uniform distribution is desired, the user stores in the first location one arbitrarily selected positive integer while the second location is left alone; if the normal distribution is needed, a different integer is stored in each of the two locations. Any integer may be arbitrarily chosen from, say, 50 to 20,000. The purpose of this is to randomly locate the point at which the generation of the user's random numbers will begin. The user, within his program, may call the subroutine as many times as he wishes without having to change the integer or integers stored in IR and still obtain distinct pseudo-random numbers. It is necessary to change these only if the user wishes to randomly locate a different point for the generation of the required random numbers.

N	A positive integer, greater or equal to one, is stored by the user. N must be set equal to the integer 1 for the first call of the subroutine and greater than 1 for all subsequent calls.
L	A value that selects the distribution of the random numbers. If the uniform distribution is desired, then L is equal to the integer 1; if the normal distribution is needed, L is set equal to the integer 2. L may be changed from 1 to 2 within the same program provided N is reset to 1 for only the first call of the subroutine after the change.
RN	A normally distributed random number will be stored in RN provided L = 2.
Y1	A uniformly distributed random number will be stored in Y1 for both L = 1 or L = 2.
Y2	An additional uniformly distributed random number will be stored in Y2 provided L = 2.

RESTRICTIONS: The calling program must dimension IR(2). See argument list.

GETRAN

METHOD: The uniformly distributed pseudo-random numbers are generated by a linearly recurring sequence of zeros and ones which is based on a primitive polynomial of degree 35 over the finite field of order two. The normal pseudo-random numbers are generated through a direct transformation from two random numbers uniformly distributed on the unit interval to a random number normally distributed with zero mean and unit variance. (See Reference.)

ACCURACY: This generator has been thoroughly tested concerning its statistical behavior. As a result, it produces numbers that appear to be random and uniformly or normally distributed.

REFERENCE: Tausworthe, R. C.: Random Numbers Generated by Linear Recurrence Modulo Two. Mathematics of Computation. Vol. 19, 1965, pp. 201-209.

STORAGE: GETRAN 1177_8 locations

FORTRAN FUNCTIONS: SQRT,ALOG,SIN

OTHER CODING INFORMATION: If normally distributed random numbers with mean other than zero and variance other than unity are required, make the following transformation:

$$X = RN \cdot \sigma + \mu$$

where σ is the desired standard deviation, μ is the desired mean, and thus X is normal with mean μ and variance σ^2.

On CDC 6600 computer the time for sets of random numbers with INPUT IR(1) = 96735, IR(2) = 192463 was as noted:

No. of Random Numbers	Time in Seconds
10,000	20.36
25,000	45.13
50,000	86.31

OUTPUT was uniformly distributed numbers on the unit interval. Time for normal numbers is slightly less than twice the above times. The INPUT, IR(1), IR(2) are somewhat larger than the user would normally use. With smaller numbers as input, the speed of GETRAN is improved.

SOURCE: NASA, LRC, George C. Canavos

QUESTIONS ON THE USE OF THIS PROGRAM SHOULD BE DIRECTED TO THE ACD PROGRAMER SUPPORT GROUP, EXT. 3548.

Appendix E3. Program SPLINE.

```
      PROGRAM SPLINE(INPUT,OUTPUT,TAPE1,TAPE2)
      DIMENSION POINT(300,3),A(303,303),B(303,1),IPIVOT(303),WK(303)
C
C  ENTER KNOWN POINTS INTO ARRAY
C
      K=0
  100 READ(1,20)X,Y,Z
   20 FORMAT(1X,3F15.5)
      IF(X.GT.998.)GO TO 110
      K=K+1
      POINT(K,1)=Z
      POINT(K,2)=Y
      POINT(K,3)=X
      GO TO 100
  110 CONTINUE
C
C  COMPUTE R2LNR2 TERMS AND PLACE IN MATRIX A
C  (UPPER RIGHT)
      LAST=K
      DO 200 N=1,LAST
      DO 200 M=1,LAST
      RSQ=(POINT(N,1)-POINT(M,1))**2 + (POINT(N,2)-POINT(M,2))**2
C  CHECK FOR LN 0
      IF(N.NE.M) GO TO 201
      A(N,M+3) =  0.
      GO TO 200
  201 A(N,M+3) = RSQ*ALOG(RSQ)
  200 CONTINUE
C
C  COMPLETE MATRIX A
C  (UPPER LEFT)
      DO 210 N=1,LAST
      A(N,1) = 1
      A(N,2) = POINT(N,1)
  210 A(N,3) = POINT(N,2)
C
C  (LOWER LEFT)
      DO 220 N=1,3
      DO 220 M=1,3
  220 A(LAST+N,M)=0
C
C  (LOWER RIGHT)
      DO 230 M=1,LAST
      A(LAST+1,M+3) = 1
      A(LAST+2,M+3) = POINT(M,1)
  230 A(LAST+3,M+3) = POINT(M,2)
C
C  FILL MATRIX B
C
      DO 300 N=1,LAST
  300 B(N,1) = POINT(N,3)
      B(LAST+1,1) = 0.
      B(LAST+2,1) = 0.
      B(LAST+3,1) = 0.
C
C  CALL GELIM & COMPUTE COEFFICIENTS
C
      N=LAST+3
      NMAX=303
      NRHS=1
      IFAC=0
      CALL GELIM(NMAX,N,A,NRHS,B,IPIVOT,IFAC,WK,IERR)
C
C  CREATE NEW FILE WITH KNOWN POINTS & COEFFICIENTS
C
      DO 400 I=1,LAST
  400 WRITE(2,40)POINT(I,3),POINT(I,2),POINT(I,1)
   40 FORMAT(1X,3F15.5)
      END=999.
      WRITE(2,41)END
   41 FORMAT(1X,F15.5)
      DO 410 I=1,N
  410 WRITE(2,42)B(I,1)
   42 FORMAT(1X,F23.13)
      STOP
      END
END OF FILE
```

APPENDIX F

PAP.SPLN

Appendix F1. Listing.

```
      PROGRAM PARSPLN(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1,TAPE2)
C***********************************************************************
C         COMPUTES RADIATION PATTERN FOR OFFSET PARABOLOIDAL REFLECTOR. *
C         AXIS OF ROTATION OF PARABOLA IS X-AXIS.                       *
C         REFLECTOR OFFSET IN Z-DIRECTION.                              *
C         FOCAL POINT OF PARABOLA AT ORIGIN OF X,Y,Z COORDINATE SYSTEM. *
C         VERTEX OF PARABOLA IS LOCATED ON NEGATIVE X-AXIS.             *
C***********************************************************************
      REAL MAJOR,MINOR
      DIMENSION P(5,2290),YFLD(101),ZFLD(101),AMINOR(3)
      EQUIVALENCE (FEED,AMINOR),(EPLANE,YFLD),(HPLANE,ZFLD)
      COMMON CA,SA,CG,SG,RK,XC,NPOINT,NPARTS,NP,NT,NPTPPL,
     .PI,PID2,DTOR,RTOD,YCBL,ZCBL,HFMABL,HFMIBL,XF,YF,ZF,DELTA,
     .FEED(3),TITLE(32),EPLANE(101),HPLANE(101)
      DATA DONE,MAX/5HDONE ,2290/
      FDB(X)=20.0*ALOG10(X)
      NPARTS=7
      NPTPPL=2250
      PI=ACOS(-1.0)
      PID2=0.5*PI
      DTOR=PI/180.
      RTOD=180./PI
C***********************************************************************
C         TITLE = FOUR LINES OF IDENTIFICATION                          *
C                 (80 ALPHANUMERIC CHARACTERS PER LINE)                 *
C         XLAM = WAVELENGTH.                                            *
C         XF,YF,ZF = X,Y,Z COORDINATES OF FEED LOCATION.                *
C         ALPHA = ANGULAR ROTATION (DEG) OF FEED ABOUT THE Z'-AXIS      *
C                 REQUIRED TO MAKE THE Y'-AXIS PARALLEL TO THE Y-AXIS.  *
C         GAMMA = ANGULAR ROTATION (DEG) OF FEED ABOUT THE Y'-AXIS      *
C                 REQUIRED TO MAKE THE Z'-AXIS PARALLEL TO THE Z-AXIS.  *
C                                                                       *
C                 NOTE:  (1)  X',Y',Z' IS FEED COORDINATE SYSTEM.       *
C                        (2)  X,Y,Z IS REFLECTOR COORDINATE SYSTEM.     *
C                        (3)  PEAK OF FEED PATTERN IS IN NEGATIVE       *
C                             X'-DIRECTION.                             *
C                        (4)  PEAK OF SECONDARY PATTERN IS IN POSITIVE  *
C                             X-DIRECTION FOR FEED AT FOCAL POINT.      *
C                        (5)  ALPHA AND GAMMA ARE DEFINED AS POSITIVE   *
C                             IF THE ROTATION IS COUNTER-CLOCKWISE      *
C                             WHEN LOOKING IN THE NEGATIVE DIRECTION    *
C                             ALONG THE AXIS OF ROTATION.               *
C                                                                       *
C         DELTA = POLARIZATION (DEG) OF FEED WRT THE Y'-AXIS.           *
C         FOCAL = FOCAL LENGTH OF PARABOLA.                             *
C         YCBL,ZCBL = Y,Z COORDINATES FOR CENTER OF FEED BLOCKAGE.      *
C         HFMABL,HFMIBL = HALF MAJOR AND HALF MINOR AXIS                *
C                         OF FEED BLOCKAGE ELLIPSE.                     *
C         P(I,1) = X,Y,Z (I=1,2,3) COORDINATES OF MINIMUM-Y             *
C                  POINT ON THE REFLECTOR EDGE.                         *
C         P(I,2) = X,Y,Z (I=1,2,3) COORDINATES OF MAXIMUM-Y             *
C                  POINT ON THE REFLECTOR EDGE.                         *
C         P(I,3) = X,Y,Z (I=1,2,3) COORDINATES OF MINIMUM-Z             *
C                  POINT ON THE REFLECTOR EDGE.                         *
C         P(I,4) = X,Y,Z (I=1,2,3) COORDINATES OF MAXIMUM-Z             *
C                  POINT ON THE REFLECTOR EDGE.                         *
C         EPLANE = E-PLANE FEED PATTERN (VOLTAGE) IN ONE-DEGREE         *
C                  INCREMENTS OFF PEAK OF BEAM.                         *
C         HPLANE = H-PLANE FEED PATTERN (VOLTAGE) IN ONE-DEGREE         *
C                  INCREMENTS OFF PEAK OF BEAM.                         *
C                                                                       *
C                  NOTE:  E-PLANE AND H-PLANE FEED PATTERNS ARE         *
C                         SYMMETRIC ABOUT BEAM PEAK.  INPUT FEED        *
C                         PATTERNS FROM 0 TO 90 DEGREES OFF PEAK.       *
C                                                                       *
C********************  INPUT DATA  *************************************
```


C-2

ORIGINAL PAGE IS
OF POOR QUALITY

```
      READ(1,10) TITLE
      READ(1,20) XLAM,XF,YF,ZF,ALPHA,GAMMA,DELTA
      READ(1,20) YCBL,ZCBL,HFMABL,HFMIBL
      READ(1,40) ((P(I,J),I=1,3),J=1,4)
      READ(1,50) (EPLANE(I),I=1,91)
      READ(1,50) (HPLANE(I),I=1,91)
10    FORMAT(8A10)
20    FORMAT(8F10.4)
40    FORMAT(3F10.4)
50    FORMAT(5F15.5)
C-----------------------------------------------------------------------
      TEM=ALPHA*DTOR
      CA=COS(TEM)
      SA=SIN(TEM)
      TEM=GAMMA*DTOR
      CG=COS(TEM)
      SG=SIN(TEM)
      FEED(1)=-(XF*CA*CG-YF*SA*CG+ZF*SG)
      FEED(2)=-(XF*SA+YF*CA)
      FEED(3)=-(-XF*CA*SG+YF*SA*SG+ZF*CG)
      RK=2.*PI/XLAM
      WRITE(6,595)TITLE,XLAM,XF,YF,ZF,ALPHA,GAMMA,DELTA
      WRITE(6,583) ((P(I,J),I=1,3),J=1,4)
      WRITE(6,584) YCBL,ZCBL,HFMABL,HFMIBL
      WRITE(6,586)
      WRITE(6,587)
      WRITE(6,590) (EPLANE(I),I=1,91)
      WRITE(6,586)
      WRITE(6,588)
      WRITE(6,590) (HPLANE(I),I=1,91)
595   FORMAT(1H1,////,11X,'SPLINE SURFACE REFLECTOR FAR FIELD RADIATION'
     .   /'                            PATTERN CALCULATION'///' ',8A10/' ',
     .    8A10/' ',8A10/' ',8A10//
     .    ' INPUT PARAMETERS-                                        ',//
     .    '   WAVELENGTH OF ELECTRIC FIELD........................',F9.4/
     .    '   FEED POSITION (XF,YF,ZF)............................',3F8.3
     .   /'   FEED ROTATION ANGLES (ALPHA,GAMMA)..................',2F8.3
     .   /'   FEED POLARIZATION ANGLE WRT Y-PRIME AXIS..........',F8.3)
583   FORMAT(
     .   /'   MINIMUM-Y POINT ON THE REFLECTOR (X,Y,Z)...........',3F8.3
     .   /'   MAXIMUM-Y POINT ON THE REFLECTOR (X,Y,Z)...........',3F8.3
     .   /'   MINIMUM-Z POINT ON THE REFLECTOR (X,Y,Z)...........',3F8.3
     .   /'   MAXIMUM-Z POINT ON THE REFLECTOR (X,Y,Z)...........',3F8.3
     .    )
584   FORMAT(/
     .    '   FEED SHADOW CENTER COORDINATES IN APERTURE PL......',2F7.2
     .   /'   HALF MAJOR AXIS OF FEED SHADOW......................',F7.2/
     .    '   HALF MINOR AXIS OF FEED SHADOW......................',F7.2/
     .    )
586   FORMAT(//' PATTERN OF FEED IN ONE DEG INCREMENTS OFF-AXIS'/)
587   FORMAT(' E-PLANE PATTERN '/)
588   FORMAT(' H-PLANE PATTERN '/)
590   FORMAT(2X,5F16.10)
      CALL APTR(P,MAX)
      CALL QUTZ(P,MAX)
C***********************************************************************
C                                                                      *
C        MAJOR = 'THETA' OR 'PHI  ' TO INDICATE CONSTANT THETA         *
C                    OR PHI ANGLE FOR PATTERN CALCULATION.             *
C        AMAJOR = VALUE (DEG) OF CONSTANT THETA OR PHI.                *
C        MINOR = 'PHI  ' OR 'THETA' TO INDICATE ANGULAR                *
C                    VARIABLE FOR PATTERN CALCULATION.                 *
C        AMINOR(I) = INITIAL, FINAL, INCREMENTAL (I=1,2,3)             *
C                         VALUES (DEG) FOR ANGULAR VARIABLE.           *
C        ----------------------                                        *
C                                                                      *
C        NOTE:  MAJOR = 'DONE ' INDICATES ALL PATTERN                  *
C                             REQUESTS HAVE BEEN INPUT.                *
C                                                                      *
C******************* INPUT PATTERN DATA *******************************
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
100   READ(1,110) MAJOR,AMAJOR,MINOR,(AMINOR(I),I=1,3)
110   FORMAT(A5,5X,F10.4,A5,5X,3F10.4)
      IF(MAJOR.EQ.DONE) GO TO 900
C-----------------------------------------------------------------------
      NANG=(AMINOR(2)-AMINOR(1))/AMINOR(3)+1.5
      IF(NANG.LE.101) GO TO 112
      WRITE(6,111)
111   FORMAT('+++ ERROR - MORE THAN 101 ANGLES IN PATTERN REQUEST +++')
      STOP
112   CONTINUE
      CALL INGT(P,MAX,MAJOR,AMAJOR,AMINOR,YFLD,ZFLD,NANG)
      FMAXY=1.0E-100
      FMAXZ=1.0E-100
      FMAXT=1.0E-100
      DO 450  J=1,NANG
      FTT=SQRT(YFLD(J)*YFLD(J)+ZFLD(J)*ZFLD(J))
      FMAXY=AMAX1(FMAXY,YFLD(J))
      FMAXZ=AMAX1(FMAXZ,ZFLD(J))
      FMAXT=AMAX1(FMAXT,FTT)
450   CONTINUE
      D=AMINOR(1)
      FMYDB=-300.0
      FMZDB=-300.0
      IF (FMAXY.GT.1.0E-15) FMYDB=FDB(FMAXY)
      IF (FMAXZ.GT.1.0E-15) FMZDB=FDB(FMAXZ)
      WRITE(6,600)MAJOR,AMAJOR,MINOR,(AMINOR(J),J=1,3)
600   FORMAT(1H1,///24X,
     .       'TABLE OF ELECTRIC FIELD STRENGTHS (DB)',/'+',23X,
     .       '_____ __ ________ _____ _________ ____',
     .     ///19X,'PRINCIPAL PLANE OF CUT IS ',A5,' = ',F8.3,' DEG'
     .       //19X,'ANGLE ',A5,' FROM',F8.3,' TO',F8.3,' BY',F6.3,' DEG')
      WRITE(6,666) MINOR
666   FORMAT(//13X,A5,4X,'DB(Z/Z)',4X,'DB(Y/Z)',4X,'DB(Z/Y)',5X,
     .       'DB(Y/Y)',5X,'PWRDB',/)
      DO 700  J=1,NANG
      DBZZ=-300.0
      DBYY=-300.0
      DBZY=-300.0
      DBYZ=-300.0
      PWRDB=-300.0
      FZZ=ZFLD(J)/FMAXZ
      FYY=YFLD(J)/FMAXY
      FZY=ZFLD(J)/FMAXY
      FYZ=YFLD(J)/FMAXZ
      FTT=SQRT(YFLD(J)*YFLD(J)+ZFLD(J)*ZFLD(J))/FMAXT
      IF(FZZ.GT.1.0E-15) DBZZ=FDB(FZZ)
      IF(FYY.GT.1.0E-15) DBYY=FDB(FYY)
      IF(FZY.GT.1.0E-15) DBZY=FDB(FZY)
      IF(FYZ.GT.1.0E-15) DBYZ=FDB(FYZ)
      IF(FTT.GT.1.0E-15) PWRDB=FDB(FTT)
      WRITE(6,690) D,DBZZ,DBYZ,DBZY,DBYY,PWRDB
690   FORMAT(10X,F9.3,5F11.5)
      D=D+AMINOR(3)
700   CONTINUE
      WRITE(6,750) FMAXZ,FMZDB,FMAXY,FMYDB
750   FORMAT(//15X,'MAXIMUM FIELD VALUES-'//15X,
     .    '     20LOG(MAX(FIELD-Z))=20LOG(',1PE15.7,')=',0PF12.7//15X,
     .    '     20LOG(MAX(FIELD-Y))=20LOG(',1PE15.7,')=',0PF12.7)
      GO TO 100
900   STOP
      END
```

```
      SUBROUTINE APTR(P,MAX)
      REAL NHAT(3)
      COMMON CA,SA,CG,SG,RK,XC,NPOINT,NPARTS,NP,NT,NPTPPL,
     .PI,PID2,DTOR,RTOD,YCBL,ZCBL,HFMABL,HFMIBL,XF,YF,ZF,DELTA,
     .FEED(3),TITLE(32),EPLANE(101),HPLANE(101)
      DIMENSION A(3,3),AINV(3,3),B(3,2),BB(3,2),C(3),EI(3),ER(3),
     .          P(5,MAX),SR(3),X(3)
      EQUIVALENCE (FEED,C,ER,SR),(X,EI)
      I=1
      XM=ABS(P(1,1))
      DO 30 J=2,4
      TEM=ABS(P(1,J))
      IF(TEM.GT.XM)GO TO 30
      XM=TEM
      I=J
30    CONTINUE
      RM=SQRT((P(2,I)-YF)**2+(P(3,I)-ZF)**2)
      A(1,1)=CA*CG
      A(1,2)=SA*CG
      A(1,3)=-SG
      A(2,1)=-SA
      A(2,2)= CA
      A(2,3)= 0.0
      A(3,1)=CA*SG
      A(3,2)=SA*SG
      A(3,3)= CG
      DO 40  I=1,3
      DO 40  J=1,3
40    AINV(I,J)=A(J,I)
      TMAX=0.0
      TMIN=PI
      PMIN=PI+PID2
      PMAX=PID2
      DO 65  I=1,4
      DO 60  J=1,3
60    X(J)=AINV(J,1)*P(1,I)+AINV(J,2)*P(2,I)+AINV(J,3)*P(3,I)+FEED(J)
      R=SQRT(X(1)*X(1)+X(2)*X(2)+X(3)*X(3))
      P(1,I)=ACOS(X(3)/R)
      SINTHT=SIN(P(1,I))
      IF (SINTHT.LT.1.E-10) SINTHT=1.E-10
      P(2,I)=PI-ASIN(X(2)/(R*SINTHT))
      IF (P(1,I).GT.TMAX) TMAX=P(1,I)
      IF (P(1,I).LT.TMIN) TMIN=P(1,I)
      IF (P(2,I).GT.PMAX) PMAX=P(2,I)
      IF (P(2,I).LT.PMIN) PMIN=P(2,I)
65    CONTINUE
      DELP=PMAX-PMIN
      DELT=TMAX-TMIN
      NP=SQRT(DELP*FLOAT(NPTPPL)/DELT)+1.0
      NP=((NP-1)/2)*2+1
      ANGINC=DELP/(FLOAT(NP)-2.6)
      TEM=ATAN(RM/(XM+XF))+2.0*ANGINC
      XM=RM*COS(TEM)/SIN(TEM)
      XC=-(XM-XF)
      NTD2=DELT/(2.0*ANGINC)+1.0
      NT=2*NTD2+1
      PMIN=PMIN-0.8*ANGINC
      PMAX=PMAX+0.8*ANGINC
      TCT=(TMAX+TMIN)/2.0
      TMIN=TCT-FLOAT(NTD2)*ANGINC
      TMAX=TCT+FLOAT(NTD2)*ANGINC
      DO 95  J=1,NT
      DO 95  K=1,NP
      I=4+(J-1)*NP+K
      P(1,I)=TMIN+(J-1)*ANGINC
95    P(2,I)=PMIN+(K-1)*ANGINC
```

```
      NTNP=NT*NP
      NPOINT=NTNP+4
      IF((NPOINT+1).GT.MAX) GO TO 900
      TMIN=TMIN*RTOD
      TMAX=TMAX*RTOD
      PMIN=PMIN*RTOD
      PMAX=PMAX*RTOD
      ANGINC=ANGINC*RTOD
      RDELTA=DTOR*DELTA
      CA=COS(RDELTA)
      SA=SIN(RDELTA)
      BB(1,2)=+FEED(1)
      BB(2,2)=+FEED(2)
      BB(3,2)=+FEED(3)
C
C  CALL SPLINE TO ESTABLISH FUNCTION COEFFICIENTS
C
      ISP=1
      CALL SPLINE(X,Y,Z,ISP)
      INEW=0
      DO 600  I=1,NPOINT
      SINP=SIN(P(2,I))
      COSP=COS(P(2,I))
      SINT=SIN(P(1,I))
      COST=COS(P(1,I))
      BB(1,1)=SINT*COSP
      BB(2,1)=SINT*SINP
      BB(3,1)=COST
      B(1,2)=A(1,1)*BB(1,2)+A(1,2)*BB(2,2)+A(1,3)*BB(3,2)
      B(2,2)=A(2,1)*BB(1,2)+A(2,2)*BB(2,2)+A(2,3)*BB(3,2)
      B(3,2)=A(3,1)*BB(1,2)+A(3,2)*BB(2,2)+A(3,3)*BB(3,2)
      B(1,1)=A(1,1)*BB(1,1)+A(1,2)*BB(2,1)+A(1,3)*BB(3,1)
      B(2,1)=A(2,1)*BB(1,1)+A(2,2)*BB(2,1)+A(2,3)*BB(3,1)
      B(3,1)=A(3,1)*BB(1,1)+A(3,2)*BB(2,1)+A(3,3)*BB(3,1)
C
C  SUCCESSIVE APPROXIMATION TO LOCATE POINT ON SPLINE SURFACE
C
      ISP=2
      ROLD=0.
      RNEW=1000.
171   R=(RNEW + ROLD)/2.
      ZO=B(3,1)*R - B(3,2)
      YO=B(2,1)*R - B(2,2)
      XO=B(1,1)*R - B(1,2)
      CALL SPLINE(XSP,YO,ZO,ISP)
      DIFF=XO-XSP
      IF(ABS(DIFF).LT..000001) GO TO 189
      IF(DIFF.LT.1.E-10) GO TO 172
      ROLD=R
      GO TO 171
172   RNEW=R
      GO TO 171
189   CONTINUE
C
C  CALL UPON SPLINE TO COMPUTE UNIT NORMAL
C
      ISP=3
      XX=XO
      YY=YO
      ZZ=ZO
      CALL SPLINE(XX,YY,ZZ,ISP)
      NHAT(1)=XX
      NHAT(2)=YY
      NHAT(3)=ZZ
C
C           XO,YO,ZO = COORDINATES OF POINT OF INTERSECTION
```

```
C                    OF RAY WITH SURFACE OF REFLECTOR.
C
C          NHAT(1), NHAT(2), NHAT(3) = X,Y,Z VECTOR COMPONENTS
C                                      OF UNIT NORMAL TO SURFACE
C                                      AT POINT OF INTERSECTION.
C
      SCALAR=2.0*(B(1,1)*NHAT(1)+B(2,1)*NHAT(2)+B(3,1)*NHAT(3))
      DO 295  K=1,3
  295 SR(K)=B(K,1)-SCALAR*NHAT(K)
      X(1)=XC-XO
      TEM=X(1)/SR(1)
      X(2)=TEM*SR(2)
      X(3)=TEM*SR(3)
      D=SQRT(X(1)*X(1)+X(2)*X(2)+X(3)*X(3))
      INEW=INEW+1
      P(1,INEW)=YO+X(2)
      P(2,INEW)=ZO+X(3)
      P(5,INEW)=RK*(R+D)
      IF(ABS(P(2,INEW)-PI)-1.0E-5)311,311,312
  311 X(2)=0.0
      GO TO 313
  312 X(2)=COS(ATAN(COST/BB(2,1))+RDELTA)
  313 X(1)=ACOS(ABS(BB(1,1)))*RTOD
      LO=X(1)+1.0
      IHI=LO+1
      TEM=X(1)-FLOAT(LO-1)
      EPI=TEM*(EPLANE(IHI)-EPLANE(LO))+EPLANE(LO)
      ETI=TEM*(HPLANE(IHI)-HPLANE(LO))+HPLANE(LO)
      X(2)=X(2)*X(2)
      X(3)=1.0-X(2)
      TEM=EPI*ETI/SQRT(ETI*ETI*X(2)+EPI*EPI*X(3))/R
      EPI=TEM*SA
      ETI=TEM*CA
      C(1)=COST*COSP*ETI-SINP*EPI
      C(2)=COST*SINP*ETI+COSP*EPI
      C(3)=-SINT*ETI
      DO 400  J=1,3
      EI(J)=0.0
      DO 400  K=1,3
  400 EI(J)=EI(J)+A(J,K)*C(K)
      SCALAR=2.0*(EI(1)*NHAT(1)+EI(2)*NHAT(2)+EI(3)*NHAT(3))
      DO 500  K=1,3
  500 ER(K)=SCALAR*NHAT(K)-EI(K)
      P(3,INEW)=ER(2)
      P(4,INEW)=ER(3)
  600 CONTINUE
      RETURN
  900 I=NPOINT+1
      WRITE(6,901)I
  901 FORMAT(/3X'NUMBER OF RAYS EXCEEDS DIMENSION OF P-ARRAY'/
     .3X'DIMENSION P(5,'I5') OR LARGER')
      STOP
      END
      SUBROUTINE QUTZ(P,MAX)
      COMMON CA,SA,CG,SG,RK,XC,NPOINT,NPARTS,NP,NT,NPTPPL,
     .PI,PID2,DTOR,RTOD,YCBL,ZCBL,HFMABL,HFMIBL,XF,YF,ZF,DELTA,
     .FEED(3),TITLE(32),EPLANE(101),HPLANE(101)
      DIMENSION P(5,MAX),PINT(5),POLD(5),PBLK(5),PRS(5,41),Z(2,101)
      EQUIVALENCE (EPLANE,Z)
      EQUIVALENCE (TITLE(1),PINT),(TITLE(6),POLD),(TITLE(11),PBLK)
      DATA YMIN,YMAX,ZMIN,ZMAX/1.0E+10,-1.0E+10,1.0E+10,-1.0E+10/
      TESTO=0.
      HFMABL=HFMABL*HFMABL
      HFMIBL=HFMIBL*HFMIBL
      NBARS=NP-2
      DO 10 J=1,NBARS
```

```
      Z(1,J)=1.0E+20
      Z(2,J)=1.0E+20
10    CONTINUE
      DO 20  I=1,4
      IF (P(1,I).GT.YMAX) YMAX=P(1,I)
      IF (P(1,I).LT.YMIN) YMIN=P(1,I)
      IF (P(2,I).GT.ZMAX) ZMAX=P(2,I)
      IF (P(2,I).LT.ZMIN) ZMIN=P(2,I)
20    CALL MOVEM(P(1,I),PR5(1,I),5)
      YDIM=YMAX-YMIN
      YCT=(YMAX+YMIN)/2.
      ZDIM=ZMAX-ZMIN
      ZCT=(ZMAX+ZMIN)/2.
      GRID=YDIM/(FLOAT(NBARS)-0.6)
      GRIDLO=YMIN+GRID/5.0
      GRIDHI=YMAX-GRID/5.0
      NDEX=4
      DO 100  I=5,NPOINT
      IF(P(1,I)-YMAX)95,95,98
95    IF(P(1,I)-YMIN)98,96,96
96    NGRID=(P(1,I)-GRIDLO)/GRID+0.5
      P(1,I)=GRIDLO+FLOAT(NGRID)*GRID
      CALL MOVEM(P(1,I),P(1,I-NDEX),5)
      GO TO 100
98    NDEX=NDEX+1
100   CONTINUE
      NPOINT=NPOINT-NDEX
      CALL PTSORT(P,5,NPOINT)
      HFMAEX=YDIM/2.0
      HFMIEX=ZDIM/2.0
      DO 430  I=1,NBARS
      Y=GRIDLO+FLOAT(I-1)*GRID
      ZZ=HFMIEX*SQRT(1.0-((Y-YCT)/HFMAEX)**2)
      Z(1,I)=-ZZ+ZCT
      Z(2,I)= ZZ+ZCT
430   CONTINUE
      L=0
      N=1
      DO 440 I=1,5
440   PBLK(I)=0.0
      YQ=P(1,1)
      IDEX=DINT((YQ-GRIDLO)/GRID+1.001)
      DO 900  I=1,NPOINT
      IF(P(1,I)-YQ)450,480,450
450   IF(L-2)460,460,470
460   N=N-L
470   L=0
      YQ=P(1,I)
      IDEX=DINT((YQ-GRIDLO)/GRID+1.001)
480   PBLK(1)=P(1,I)
      PBLK(2)=P(2,I)
      TEST=-1.0
      IF (P(2,I).EQ.Z(1,IDEX).OR.P(2,I).EQ.Z(2,IDEX))  TEST= 0.0
      IF (P(2,I).GT.Z(1,IDEX).AND.P(2,I).LT.Z(2,IDEX)) TEST=1.0
      PZ=P(2,I)-ZCBL
      PY=P(1,I)-YCBL
      TESTBL=HFMABL*HFMIBL-HFMABL*PZ*PZ-HFMIBL*PY*PY
      IF (TEST) 701,501,501
501   IF(TESTBL)510,510,502
502   CALL MOVEM(PBLK,P(1,N),5)
      GO TO 515
510   CALL MOVEM(P(1,I),P(1,N),5)
515   N=N+1
      L=L+1
      IF(TEST)701,800,701
701   IF(L)702,800,702
```

```
702     TTEST=TEST*TESTO
        IF(TTEST)704,800,800
704     CALL INTPL(POLD,P(1,I),PINT,Z(1,IDEX))
        NCHG=0
        IF(TEST)711,710,710
710     CALL MOVEM(P(1,N-1),P(1,N),5)
        NCHG=1
711     CALL MOVEM(PINT,PBLK,2)
        PZ=PINT(2)-ZCBL
        PY=PINT(1)-YCBL
        TESTBL=HFMABL*HFMIBL-HFMABL*PZ*PZ-HFMIBL*PY*PY
        IF(TESTBL)720,720,715
715     CALL MOVEM(PBLK,P(1,N-NCHG),5)
        GO TO 725
720     CALL MOVEM(PINT,P(1,N-NCHG),5)
725     N=N+1
        L=L+1
800     CALL MOVEM(P(1,I),POLD,5)
        TESTO=TEST
900     CONTINUE
        NPOINT=N-1
        CALL MOVEM(PR5,P(1,N),20)
        RETURN
        END
        FUNCTION DINT(A)
        J=A
        DINT=FLOAT(J)
        RETURN
        END
        SUBROUTINE MOVEM(AOLD,ANEW,N)
        DIMENSION AOLD(N),ANEW(N)
        IF(N.LE.0) RETURN
        DO 100 I=1,N
        ANEW(I)=AOLD(I)
100     CONTINUE
        RETURN
        END
        SUBROUTINE PTSORT(A,NCOL,NROW)
        DIMENSION A(NCOL,NROW),SWAP(5)
        DO  900 I=2,NROW
        DO  900 J=I,NROW
        IF ( A(1,J)-A(1,I-1) ) 100,200,900
100     DO  150 K=1,NCOL
        SWAP(K)=A(K,I-1)
        A(K,I-1)=A(K,J)
150     A(K,J)=SWAP(K)
        GO TO 900
200     IF ( A(2,J)-A(2,I-1) ) 220,900,900
220     DO  250 K=1,NCOL
        SWAP(K)=A(K,I-1)
        A(K,I-1)=A(K,J)
250     A(K,J)=SWAP(K)
900     CONTINUE
        RETURN
        END
        SUBROUTINE INTPL(PLO,PHI,PINT,Z)
        DIMENSION PLO(5),PHI(5),PINT(5),Z(2)
        ZC=Z(1)
        IF (PLO(2).GT.Z(1)) ZC=Z(2)
        FAC=(ZC-PLO(2))/(PHI(2)-PLO(2))
        DO 10  I=1,5
10      PINT(I)=PLO(I)+FAC*(PHI(I)-PLO(I))
        RETURN
        END
        SUBROUTINE INGT(P,MAX,MAJOR,AMAJOR,AMINOR,YFLD,ZFLD,NANG)
        REAL MAJOR
```

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```
      COMPLEX CTEMP,CZ1,CZ2,CY1,CY2,TSZ,TSY,DZI,DYI,ZIOLD,YIOLD,
     .       ZI,YI,FLDZ,FLDY
      DIMENSION AMINOR(3),P(5,MAX),YFLD(NANG),ZFLD(NANG)
      COMMON CA,SA,CG,SG,RK,XC,NPOINT,NPARTS,NP,NT,NPTPPL,
     .PI,PID2,DTOR,RTOD,YCBL,ZCBL,HFMABL,HFMIBL,XF,YF,ZF,DELTA,
     .FEED(3),TITLE(32),EPLANE(101),HPLANE(101)
      DATA HPHI/5HPHI  /
      SEN=999.0
      RPART=1./NPARTS
      NTH=NPOINT+1
      DO 300 N=1,5
300   P(N,NTH)=SEN
      DEG=AMAJOR
      DEGR=DEG*DTOR
      DLOR=AMINOR(1)*DTOR
      DICR=AMINOR(3)*DTOR
      DSTOPR=AMINOR(2)*DTOR+DICR*0.5
      NTH=0
      D=DLOR
      IF (MAJOR.NE.HPHI)  GO TO 3400
400   COSP=COS(DEGR)
      SINP=SIN(DEGR)
      COST=COS(D)
      SINT=SIN(D)
      GO TO 3425
3400  COSP=COS(D)
      SINP=SIN(D)
      COST=COS(DEGR)
      SINT=SIN(DEGR)
3425  NTH=NTH+1
      CTSP=COST*SINP
      ZK=RK*COST
      YK=RK*SINP*SINT
      IOLD=1
      INEW=2
      FLDY=(0.0,0.0)
      FLDZ=(0.0,0.0)
      YOLD=SEN
      YI=(0.0,0.0)
      ZI=(0.0,0.0)
3450  CONTINUE
      IF(P(1,IOLD) .NE. P(1,INEW)) GO TO 4000
      Z=P(2,IOLD)
      ERY=P(3,IOLD)
      ERZ=P(4,IOLD)
      PH=P(5,IOLD)
      DZ=(P(2,INEW)-Z)*RPART
      DERY=(P(3,INEW)-ERY)*RPART
      DERZ=(P(4,INEW)-ERZ)*RPART
      DPH=(P(5,INEW)-PH)*RPART
      CTEMP=(0.,1.)*(ZK*Z-PH)
      CTEMP=CEXP(CTEMP)
      CZ1=ERZ*COSP*CTEMP
      CY1=(ERY*SINT+ERZ*CTSP)*CTEMP
      TSY=(0.0,0.0)
      TSZ=(0.0,0.0)
      DO 3700 N=1,NPARTS
      Z=Z+DZ
      ERY=ERY+DERY
      ERZ=ERZ+DERZ
      PH=PH+DPH
      CTEMP=(0.,1.)*(ZK*Z-PH)
      CTEMP=CEXP(CTEMP)
      CZ2=ERZ*COSP*CTEMP
      CY2=(ERY*SINT+ERZ*CTSP)*CTEMP
      TSZ=TSZ+CZ1+CZ2
```

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```
      TSY=TSY+CY1+CY2
      CZ1=CZ2
      CY1=CY2
3700  CONTINUE
      ZI=ZI+TSZ*(.5*DZ)
      YI=YI+TSY*(.5*DZ)
3900  IOLD=IOLD+1
      INEW=INEW+1
      GO TO 3450
4000  CONTINUE
      YNEW=P(1,IOLD)
      IF(YOLD.EQ.SEN) GO TO 4400
4200  DZI=(ZI-ZIOLD)*RPART
      DYI=(YI-YIOLD)*RPART
      DY=(YNEW-YOLD)*RPART
      CTEMP=(0.,1.)*YK*YOLD
      CTEMP=CEXP(CTEMP)
      CZ1=ZIOLD*CTEMP
      CY1=YIOLD*CTEMP
      TSY=(0.0,0.0)
      TSZ=(0.0,0.0)
      DO 4300 N=1,NPARTS
      YOLD=YOLD+DY
      ZIOLD=ZIOLD+DZI
      YIOLD=YIOLD+DYI
      CTEMP=(0.,1. *YK*YOLD
      CTEMP=CEXP(CTEMP)
      CZ2=ZIOLD*CTEMP
      CY2=YIOLD*CTEMP
      TSZ=TSZ+CZ1+CZ2
      TSY=TSY+CY1+CY2
      CZ1=CZ2
      CY1=CY2
4300  CONTINUE
      FLDZ=FLDZ+TSZ*(.5*DY)
      FLDY=FLDY+TSY*(.5*DY)
4400  CONTINUE
      YOLD=YNEW
      ZIOLD=ZI
      YIOLD=YI
      YI=(0.0,0.0)
      ZI=(0.0,0.0)
      IF(P(1,INEW) .NE. SEN) GO TO 3900
      YFLD(NTH)=CABS(FLDY)
      ZFLD(NTH)=CABS(FLDZ)
      D=D+DICR
      IF (D.GT.DSTOPR)  GO TO 5000
      IF (MAJOR.EQ.HPHI)  GO TO 400
      GO TO 3400
5000  CONTINUE
      RETURN
      END
      SUBROUTINE SPLINE(X,Y,Z,ISP)
      DIMENSION POINT(234,3),A(237,237),B(237,1),IPIVOT(237),WK(237)
      GO TO (601,602,603),ISP
C
C
C   COMPUTE FUNCTION COEFFICIENTS USING MEASURED POINTS
C
C
  601 K=0
  100 READ(2,20)X,Y,Z
   20 FORMAT(1X,3F15.5)
      IF(X.GT.998.)GO TO 110
      K=K+1
      POINT(K,1)=Z
```

```
      POINT(K,2)=Y
      POINT(K,3)=X
      GO TO 100
  110 CONTINUE
C
C  COMPUTE R2LNR2 TERMS AND PLACE IN MATRIX A
C  (UPPER RIGHT)
      LAST=K
      DO 200 N=1,LAST
      DO 200 M=1,LAST
      RSQ=(POINT(N,1)-POINT(M,1))**2 + (POINT(N,2)-POINT(M,2))**2
C  CHECK FOR LN 0
      IF(N.NE.M) GO TO 201
      A(N,M+3) =  0.
      GO TO 200
  201 A(N,M+3) = RSQ*ALOG(RSQ)
  200 CONTINUE
C
C  COMPLETE MATRIX A
C  (UPPER LEFT)
      DO 210 N=1,LAST
      A(N,1) = 1
      A(N,2) = POINT(N,1)
  210 A(N,3) = POINT(N,2)
C
C  (LOWER LEFT)
      DO 220 N=1,3
      DO 220 M=1,3
  220 A(LAST+N,M)=0
C
C  (LOWER RIGHT)
      DO 230 M=1,LAST
      A(LAST+1,M+3) = 1
      A(LAST+2,M+3) = POINT(M,1)
  230 A(LAST+3,M+3) = POINT(M,2)
C
C  FILL MATRIX B
C
      DO 300 N=1,LAST
  300 B(N,1) = POINT(N,3)
      B(LAST+1,1) = 0.
      B(LAST+2,1) = 0.
      B(LAST+3,1) = 0.
C
C  CALL GELIM & COMPUTE COEFFICIENTS
C
C   INITIALIZE GELIM PARAMETERS
      N=LAST+3
      NMAX=N
      NRHS=1
      IFAC=0
      CALL GELIM(NMAX,N,A,NRHS,B,IPIVOT,IFAC,WK,IERR)
      RETURN
C
C
C  INTERPOLATE POINTS ON SPLINE SURFACE
C
C
  602 SUM=0.
      DO 420 N=1,LAST
      RSQ=(Z-POINT(N,1))**2 + (Y-POINT(N,2))**2
  420 SUM = SUM + B(N+3,1)*RSQ*ALOG(RSQ+1.E-20)
      X=B(1,1) + B(2,1)*Z + B(3,1)*Y + SUM
C
      RETURN
C
```

```
C
C  COMPUTE UNIT NORMAL VECTOR AT POINT ON SPLINE SURFACE
C
C
  603 SUMY=0.0
      SUMZ=0.0
      DO 500 N=1,LAST
      FUNC=(1.0 + ALOG((Z-POINT(N,1))**2 + (Y-POINT(N,2))**2 +
      1.E-20))*2.0*B(N+3,1)
      SUMY=SUMY + (Y-POINT(N,2))*FUNC
  500 SUMZ=SUMZ + (Z-POINT(N,1))*FUNC
      PARTY=B(3,1) + SUMY
      PARTZ=B(2,1) + SUMZ
      DENOM=SQRT(1.0 + PARTY**2 + PARTZ**2)
      X=1.0/DENOM
      Y=-1.0*PARTY/DENOM
      Z=-1.0*PARTZ/DENOM
      RETURN
C
      END
END OF FILE
```

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Appendix F2. Input files for PARSPLN.

```
35 GHZ OFFSET DISTORTED SPHERICAL REFLECTOR EXCITED BY CONICAL
DUAL-MODE HORN (FEED LOCATED AT FOCAL POINT OF REFFLECTOR)
(MARCH 1981)  (POLARIZED IN Z-DIRECTION)
.33745782 0.0         0.0        0.0        0.0        0.0        -40.0
0.0       0.0         0.0        0.0
-9.54680  -5.07130    7.76100
-9.59370  +3.06800    7.81245
-11.3836  0.16065     3.05745
-7.7525   0.14250     13.52045
          1.00000          .96605          .94951          .93325          .91201
           .89125          .85605          .81283          .76736          .72444
           .66834          .60256          .56234          .51880          .46774
           .41687          .37154          .32734          .28184          .24831
           .21135          .18197          .15488          .13335          .11614
           .10000          .08414          .06839          .06026          .05309
           .04732          .04217          .03758          .03350          .02985
           .02600          .02239          .01778          .01413          .01122
           .00891          .00708          .00562          .00447          .00355
           .00282          .00224          .00178          .00141          .00112
           .00089          .00071          .00056          .00045          .00035
           .00028          .00022          .00018          .00014          .00011
           .00009          .00007          .00006          .00004          .00004
           .00003          .00003          .00002          .00002          .00002
           .00002          .00001          .00001          .00001          .00001
           .00001          .00001          .00001          .00001          .00001
           .00001          .00000          .00000          .00000          .00000
           .00000          .00000          .00000          .00000          .00000
           .00000
          1.00000          .97724          .96605          .94951          .93325
           .91201          .88105          .84140          .79433          .74989
           .70795          .66834          .60954          .56234          .52481
           .47315          .42170          .37584          .33497          .29512
           .26002          .22387          .18836          .16406          .14125
           .12162          .10471          .09333          .08610          .07943
           .07586          .07244          .06918          .06607          .06457
           .05957          .05689          .05370          .05070          .04677
           .04315          .03981          .03631          .03199          .02818
           .02512          .02239          .01995          .01778          .01585
           .01413          .01259          .01122          .01000          .00891
           .00794          .00708          .00631          .00562          .00501
           .00447          .00398          .00355          .00316          .00282
           .00251          .00224          .00200          .00178          .00158
           .00141          .00126          .00112          .00100          .00089
           .00079          .00071          .00063          .00056          .00050
           .00045          .00040          .00035          .00032          .00028
           .00025          .00022          .00020          .00018          .00016
           .00014
THETA      90.00       PHI        -12.0       0.0        .25
THETA      90.00       PHI        0.0         12.0       .25
DONE
END OF FILE
```

Input file for NRFLCTM.

```
35 GHZ OFFSET DISTORTED SPHERICAL REFLECTOR EXCITED BY CONICAL
DUAL-MODE HORN (FEED LOCATED AT FOCAL POINT OF REFFLECTOR)
(MARCH 1981)  (POLARIZED IN Z-DIRECTION)
0.0        0.0        0.0        0.0        0.0        -40.0      0.33745782
6                     0 24.000   0.0        0.0
0.0        0.0        0.0        0.0        0.0
-5.0       0.0        0.0        0.0        0.0
        1.00000        .96605        .94951        .93325        .91201
         .89125        .85605        .81283        .76736        .72444
         .66834        .60256        .56234        .51880        .46774
         .41687        .37154        .32734        .28184        .24831
         .21135        .18197        .15488        .13335        .11614
         .10000        .08414        .06839        .06026        .05309
         .04732        .04217        .03758        .03350        .02985
         .02600        .02239        .01778        .01413        .01122
         .00891        .00708        .00562        .00447        .00355
         .00282        .00224        .00178        .00141        .00112
         .00089        .00071        .00056        .00045        .00035
         .00028        .00022        .00018        .00014        .00011
         .00009        .00007        .00006        .00004        .00004
         .00003        .00003        .00002        .00002        .00002
         .00002        .00001        .00001        .00001        .00001
         .00001        .00001        .00001        .00001        .00001
         .00001        .00000        .00000        .00000        .00000
         .00000        .00000        .00000        .00000        .00000
         .00000
        1.00000        .97724        .96605        .94951        .93325
         .91201        .88105        .84140        .79433        .74989
         .70795        .66834        .60954        .56234        .52481
         .47315        .42170        .37584        .33497        .29512
         .26002        .22387        .18836        .16406        .14125
         .12162        .10471        .09333        .08610        .07943
         .07586        .07244        .06918        .06607        .06457
         .05957        .05689        .05370        .05070        .04677
         .04315        .03981        .03631        .03199        .02818
         .02512        .02239        .01995        .01778        .01585
         .01413        .01259        .01122        .01000        .00891
         .00794        .00708        .00631        .00562        .00501
         .00447        .00398        .00355        .00316        .00282
         .00251        .00224        .00200        .00178        .00158
         .00141        .00126        .00112        .00100        .00089
         .00079        .00071        .00063        .00056        .00050
         .00045        .00040        .00035        .00032        .00028
         .00025        .00022        .00020        .00018        .00016
         .00014
-9.54680   -5.07130   7.76100
-9.59370   +5.06800   7.81245
-11.3836   0.16065    3.05745
-7.7525    0.14250    13.52045
221        1
THETA      90.00      PHI        -12.0      0.0        .25
THETA      90.00      PHI        0.0        12.0       .25
DONE
END OF FILE
```

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Appendix F3. Output data.

SPLINE SURFACE REFLECTOR FAR FIELD RADIATION
PATTERN CALCULATION

35 GHZ OFFSET DISTORTED SPHERICAL REFLECTOR EXCITED BY CONICAL
DUAL-MODE HORN (FEED LOCATED AT FOCAL POINT OF REFFLECTOR)
(MARCH 1981) (POLARIZED IN Z-DIRECTION)

INPUT PARAMETERS-

WAVELENGTH OF ELECTRIC FIELD...........................	.3375		
FEED POSITION (XF,YF,ZF)...............................	0.000	0.000	0.000
FEED ROTATION ANGLES (ALPHA,GAMMA).....................	0.000	0.000	
FEED POLARIZATION ANGLE WRT Y-PRIME AXIS...............	-40.000		
MINIMUM-Y POINT ON THE REFLECTOR (X,Y,Z)...............	-9.547	-5.071	7.761
MAXIMUM-Y POINT ON THE REFLECTOR (X,Y,Z)...............	-9.594	5.068	7.812
MINIMUM-Z POINT ON THE REFLECTOR (X,Y,Z)...............	-11.384	.161	3.057
MAXIMUM-Z POINT ON THE REFLECTOR (X,Y,Z)...............	-7.753	.143	13.520
FEED SHADOW CENTER COORDINATES IN APERTURE PL..........	0.00	0.00	
HALF MAJOR AXIS OF FEED SHADOW.........................	0.00		
HALF MINOR AXIS OF FEED SHADOW.........................	0.00		

PATTERN OF FEED IN ONE DEG INCREMENTS OFF-AXIS

E-PLANE PATTERN

1.0000000000	.9640500000	.9495100000	.9332500000	.9120100000
.8912500000	.8560500000	.8128300000	.7673600000	.7244400000
.6683400000	.6025600000	.5623400000	.5188000000	.4677400000
.4168700000	.3715400000	.3273400000	.2818400000	.2483100000
.2113500000	.1819700000	.1548800000	.1333500000	.1161400000
.1000000000	.0841400000	.0683900000	.0602600000	.0530900000
.0473200000	.0421700000	.0375800000	.0335000000	.0298500000
.0260000000	.0223900000	.0177800000	.0141300000	.0112200000
.0089100000	.0070800000	.0056200000	.0044700000	.0035500000
.0028200000	.0022400000	.0017800000	.0014100000	.0011200000
.0008900000	.0007100000	.0005600000	.0004500000	.0003500000
.0002800000	.0002200000	.0001800000	.0001400000	.0001100000
.0000900000	.0000700000	.0000600000	.0000400000	.0000400000
.0000300000	.0000300000	.0000200000	.0000200000	.0000200000
.0000200000	.0000100000	.0000100000	.0000100000	.0000100000
.0000100000	.0000100000	.0000100000	.0000100000	.0000100000
.0000100000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
0.0000000000				

PATTERN OF FEED IN ONE DEG INCREMENTS OFF-AXIS

H-PLANE PATTERN

1.0000000000	[illegible]	[illegible]	[illegible]	[illegible]
.9120100000	.8810500000	.8464000000	.7745300000	.7498900000
.7079500000	.6683400000	.6095400000	.5623400000	.5248100000
.4731300000	.4217000000	.3758400000	.3349700000	.2951200000
.2600200000	.2238700000	.1883600000	.1640600000	.1412500000
.1216200000	.1047100000	.0933300000	.0861000000	.0774600000
.0758600000	.0724400000	.0691800000	.0660700000	.0645700000
.0595700000	.0568900000	.0537000000	.0507600000	.0467700000
.0481500000	.0398100000	.0363100000	.0319900000	.0281800000
.0251200000	.0223900000	.0199500000	.0177800000	.0158500000
.0141300000	.0125900000	.0112200000	.0100000000	.0089100000
.0079400000	.0070800000	.0063100000	.0056200000	.0050100000
.0044700000	.0039800000	.0035500000	.0031600000	.0028200000
.0025100000	.0022400000	.0020000000	.0017800000	.0015800000
.0014100000	.0012600000	.0011200000	.0010000000	.0008900000
.0007900000	.0007100000	.0006300000	.0005600000	.0005000000
.0004500000	.0004000000	.0003500000	.0003200000	.0002800000
.0002500000	.0002200000	.0002000000	.0001800000	.0001600000
.0001400000				

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM -12.000 TO 0.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
-12.000	-28.61699	-26.97929	-30.09128	-28.45358	-28.52080
-11.750	-28.29117	-26.66467	-29.76545	-28.13896	-28.20162
-11.500	-28.04013	-26.42512	-29.51441	-27.89941	-27.95739
-11.250	-27.92092	-26.31896	-29.39521	-27.79325	-27.84590
-11.000	-27.97909	-26.39331	-29.45338	-27.86760	-27.91362
-10.750	-28.24976	-26.68601	-29.72404	-28.16029	-28.19728
-10.500	-28.75932	-27.22828	-30.23360	-28.70256	-28.72608
-10.250	-29.52608	-28.04679	-31.00037	-29.52108	-29.52316
-10.000	-30.55835	-28.16343	-32.03264	-30.63772	-30.60453
-9.750	-31.84770	-30.58964	-33.32199	-32.06393	-31.97268
-9.500	-33.35422	-32.30710	-34.82851	-33.78138	-33.59858
-9.250	-34.98307	-34.21882	-36.45736	-35.69311	-35.38356
-9.000	-36.56957	-36.06714	-38.04386	-37.54143	-37.11050
-8.750	-37.92324	-37.43810	-39.39752	-38.91239	-38.47330
-8.500	-38.93981	-38.08190	-40.41410	-39.55619	-39.28911
-8.250	-39.59628	-38.14426	-41.07056	-39.61855	-39.60927
-8.000	-39.66491	-37.71942	-41.13920	-39.19370	-39.38353
-7.750	-38.58910	-36.50527	-40.06338	-37.97955	-38.22278
-7.500	-36.29861	-34.33860	-37.77290	-35.81289	-36.00836
-7.250	-33.52769	-31.68304	-35.00198	-33.15733	-33.30756
-7.000	-30.89255	-29.09091	-32.36684	-30.56520	-30.69837
-6.750	-28.63368	-26.83663	-30.10797	-28.31091	-28.44226
-6.500	-26.81789	-25.01213	-28.29218	-26.48642	-26.62123
-6.250	-25.46706	-23.64761	-26.94135	-25.12189	-25.26215
-6.000	-24.60803	-22.76849	-26.08232	-24.24277	-24.39099
-5.750	-24.29843	-22.42370	-25.77271	-23.89798	-24.06008
-5.500	-24.65996	-22.71329	-26.13424	-24.18757	-24.37786
-5.250	-25.95896	-23.83965	-27.43325	-25.31393	-25.57070
-5.000	-28.87887	-26.21087	-30.35316	-27.68515	-28.14254
-4.750	-35.82553	-30.14019	-37.29981	-31.61448	-32.91164
-4.500	-34.79953	-29.30638	-36.27382	-30.78067	-32.03625
-4.250	-25.79072	-23.28172	-27.26501	-24.75601	-25.156[illegible]
-4.000	-20.75983	-18.72546	-22.23412	-20.19975	-20.42400
-3.750	-17.26711	-15.35050	-18.74140	-16.82479	-17.00333
-3.500	-14.59144	-12.70014	-16.06573	-14.17443	-14.34305
-3.250	-12.42495	-10.52566	-13.89923	-11.99995	-12.17170
-3.000	-10.60128	-8.68220	-12.07556	-10.15649	-10.33599
-2.750	-9.01754	-7.07866	-10.49183	-8.55295	-8.74019
-2.500	-7.60685	-5.65622	-9.08113	-7.13050	-7.32233
-2.250	-6.32733	-4.37836	-7.80162	-5.85264	-6.04383
-2.000	-5.15659	-3.22510	-6.63087	-4.69939	-4.88375
-1.750	-4.08701	-2.18852	-5.56130	-3.66281	-3.83425
-1.500	-3.12110	-1.26871	-4.59539	-2.74300	-2.89629
-1.250	-2.26695	-.47035	-3.74123	-1.94464	-2.07581
-1.000	-1.53466	.19995	-3.00895	-1.27433	-1.38073
-.750	-.93412	.73535	-2.40841	-.73894	-.81906
-.500	-.47382	1.12961	-1.94811	-.34467	-.39792
-.250	-.16063	1.37743	-1.63492	-.09686	-.12327
0.000	0.00000	1.47429	-1.47429	0.00000	0.00000

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(1.1412840E-01)= -18.8521256

20LOG(MAX(FIELD-Y))=20LOG(1.3524089E-01)= -17.3778393

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE OF ELECTRIC FIELD STRENGTHS (DB)

PRINCIPAL PLANE OF CUT IS THETA = 90.000 DEG

ANGLE PHI FROM 0.000 TO 12.000 BY .250 DEG

PHI	DB(Z/Z)	DB(Y/Z)	DB(Z/Y)	DB(Y/Y)	PWRDB
0.000	-.00363	1.47065	-1.47429	0.00000	0.00000
.250	0.00000	1.41257	-1.47065	-.05808	-.03230
.500	-.15734	1.19569	-1.62799	-.27496	-.22412
.750	-.47970	.81578	-1.95035	-.65488	-.57960
1.000	-.97173	.26771	-2.44238	-1.20295	-1.10372
1.250	-1.63934	-.45520	-3.10999	-1.92585	-1.80280
1.500	-2.49032	-1.36198	-3.96097	-2.83263	-2.68538
1.750	-3.53521	-2.46511	-5.00586	-3.93577	-3.76306
2.000	-4.78821	-3.78196	-6.25886	-5.25262	-5.05178
2.250	-6.26829	-5.33667	-7.73894	-6.80732	-6.57332
2.500	-7.99991	-7.16264	-9.47057	-8.63329	-8.35690
2.750	-10.01207	-9.30483	-11.48272	-10.77548	-10.43984
3.000	-12.33025	-11.81813	-13.80091	-13.28879	-12.86242
3.250	-14.94403	-14.74303	-16.41469	-16.21368	-15.63814
3.500	-17.70108	-17.97725	-19.17173	-19.44790	-18.63274
3.750	-20.08948	-20.84133	-21.56014	-22.31198	-21.24493
4.000	-21.34546	-21.98409	-22.81611	-23.45475	-22.44882
4.250	-21.48149	-21.55197	-22.95214	-23.02262	-22.31235
4.500	-21.29627	-20.93159	-22.76692	-22.40224	-21.90587
4.750	-21.34640	-20.75128	-22.81705	-22.22194	-21.83443
5.000	-21.83547	-21.13624	-23.30612	-22.60689	-22.26757
5.250	-22.83881	-22.11171	-24.30946	-23.58236	-23.25583
5.500	-24.42234	-23.72762	-25.89299	-25.19827	-24.85687
5.750	-26.69714	-26.11418	-28.16779	-27.58483	-27.19166
6.000	-29.86111	-29.57609	-31.33176	-31.04675	-30.51204
6.250	-34.14637	-34.88179	-35.61702	-36.35244	-35.29430
6.500	-38.33307	-43.26373	-39.80372	-44.73439	-40.92907
6.750	-37.47055	-40.33714	-38.94120	-41.80779	-39.46727
7.000	-34.95160	-35.81801	-36.42225	-37.28866	-36.15900
7.250	-33.57640	-33.96421	-35.04706	-35.43486	-34.56175
7.500	-33.30603	-33.62381	-34.77669	-35.09446	-34.25779
7.750	-34.00552	-34.46278	-35.47617	-35.93344	-35.02391
8.000	-35.70891	-36.57910	-37.17957	-38.04976	-36.91802
8.250	-38.60989	-40.69537	-40.08054	-42.16602	-40.32440
8.500	-42.26882	-49.26156	-43.73947	-50.73221	-45.28358
8.750	-41.53873	-44.31948	-43.00939	-45.79013	-43.50602
9.000	-37.33392	-37.57405	-38.80457	-39.04471	-38.24810
9.250	-34.01001	-33.76160	-35.48066	-35.23225	-34.67980
9.500	-31.63468	-31.21545	-33.10533	-32.68610	-32.21578
9.750	-29.90848	-29.38196	-31.37913	-30.85261	-30.43301
10.000	-28.64492	-28.02158	-30.11557	-29.49224	-29.11785
10.250	-27.73634	-27.01323	-29.20700	-28.48389	-28.15553
10.500	-27.11918	-26.28939	-28.58983	-27.76004	-27.48027
10.750	-26.75448	-25.80873	-28.22513	-27.27938	-27.05168
11.000	-26.61661	-25.54224	-28.08726	-27.01289	-26.84206
11.250	-26.68528	-25.46479	-28.15593	-26.93544	-26.82807
11.500	-26.93828	-25.54850	-28.40893	-27.01915	-26.98380
11.750	-27.34217	-25.75618	-28.81282	-27.22683	-27.27294
12.000	-27.83933	-26.03438	-29.30999	-27.50503	-27.63952

MAXIMUM FIELD VALUES-

20LOG(MAX(FIELD-Z))=20LOG(1.1417615E-01)= -18.8484921

20LOG(MAX(FIELD-Y))=20LOG(1.3524089E-01)= -17.3778393

END OF FILE